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Event and Comment.

Food Needs of 1944.

IN a special article in this issue, Mr. T. L. Williams, Minister for Agriculture and Stock, stresses the importance of increased food production during 1944, and pays tribute to the farmers and graziers of Queensland who have already contributed substantially to the food needs of the Commonwealth and Allied Nations, in spite of shortage of labour and of other essential requirements of full-scale primary production. There is no doubt that producers will continue to respond readily and wholeheartedly to the call for a progressively expanding output as far as means, facilities, and seasonal circumstances will allow them. Food production has become a No. 1 priority in Australia's war effort. Food will be needed for our fighting forces until the fighting finishes; food is needed for the people of Britain who have held the fort for more than four years of war; and food is needed for those hungry people who are being set free as our armies march along the road to victory.

The food producers of Queensland know all this and they know, too, that in food production there can be no to-morrow or the day after. And they also know that in crop production there are many hazards, and they look to the powers that be to reduce those risks as far as practicable by ensuring supplies for the maintenance of equipment and essential transport and the availability of materials without which a full measure of production may be unattainable. They may count, however, on the co-operation of the Queensland Government, as stated by Mr. Williams, in every effort to reach the crop objectives set for 1944.

THE MINISTER'S NEW YEAR MESSAGE

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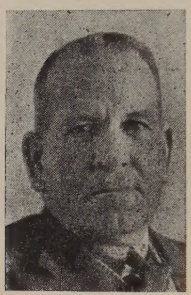
AS we stand upon the threshold of the New Year, I wish to pay a sincere tribute to the farmers and graziers of Queensland for the friendly co-operation and assistance they have freely given to me as Minister and to the officers of the Department of Agriculture and Stock.



Although the stress and strain of circumstance have been heavy during the past year, our primary producers have responded nobly to national needs. They have not only maintained the production of essential foods but, in some cases, actually increased it.

Apart from the service and the sacrifice of our fighting forces, which we acknowledge with pride and with reverence, no contribution to a country at war can have greater value than that given by the farming community.

Confidence and courage are keynotes of Australian character. In these and in all those other things which build a nation and make it secure, the food producers of Queensland have worthily carried on the traditions of their pioneering forebears.

Throughout the year now beginning we shall need active and intelligent co-operation from all in our allotted tasks. These call for vigorous and sustained effort as our contribution to the coming victory and to the building of an Australia worthy of the men and women who have offered all in her defence.

To the primary producers of Queensland, I wish health and happiness in the year now opening before us, and a happy reunion at home with those now absent.

J. Williams.

Secretary for Agriculture and Stock.

1st January, 1944.

The Drive for Increased Production.

T. L. WILLIAMS.

In this article the Hon. T. L. Williams, M.L.A., Minister for Agriculture and Stock, expresses appreciation of the achievements of the primary producers of Queensland in the past year and stresses strongly the need for greater food production in relation to national needs and in fulfilment of Commonwealth commitments during 1944.

BECAUSE of abnormal conditions arising out of the war, the agricultural and stockraising industries of Queensland, in common with the industries of other States, are faced with many complex problems.

It is only to be expected after more than four years of war, during which the resources of the Commonwealth had to be mobilized, that the effects on production, marketing, and distribution have been most disturbing. That was substantially the situation when I assumed the responsible office of Minister for Agriculture and Stock just twelve months ago. Since then, problems of manpower, supply, transport, and other matters affecting production and the welfare of the land industries have become progressively more acute. Practical solutions have been found for some of these problems; others have so far proved more difficult because of constantly changing conditions.

Here I would like to record my appreciation of the friendly and valuable co-operation which I have received from producers and their organizations representing every rural enterprise. No other section of the civil population has given greater service to the nation than the men on the land and their wives and children. But for their arduous work in all sorts of weather, sometimes before sunrise and long after dark, it would have been impossible to maintain food production at its present level.

I also desire to pay a well-deserved tribute to the officers of every branch of the Department which I have been called upon to administer. Through enlistments, transfers to Federal Departments, and call-ups for other services, the staff has been considerably depleted, but those remaining have undertaken the consequent additional work in an admirable spirit, discharging their onerous duties with determination and efficiency.

The heavy responsibility of ensuring adequate supplies of essential foods on a continually expanding scale has been necessarily my main preoccupation and that of departmental officers. The fact now is that, notwithstanding an extraordinary increase in the number of consumers, the general supply position in Queensland compares favourably with that in other States.

Food Requirements for 1944.

In the present year, greater demands than ever before in our history will be made on the food resources of Australia. That is the position we have to face.

Food production objectives have been set for 1944. To attain these targets, it will be necessary to provide for substantially increased production of practically all essential foodstuffs, including meat, wheat, sugar, butter, cheese, eggs, and potatoes. There are, admittedly, many difficulties in the way of farmers who are called on to extend their cultivated

acreages or to increase their output. Still, it is not so much the number of acres under crop that counts; it is the yield from those acres that really matters. An increased yield of every kind of farm-grown food is, after all, our main objective. Another half gallon a week from every milking cow would, for instance, mean the attainment of our dairy production goal. And that idea could be applied to every other form of food production—one more acre properly cultivated, one more ton added to the weight of a crop yield, one more prime beast turned off our pastures, one more pig fattened to factory requirements, one more dozen eggs a day from every poultry farm and we would be right on our food production targets. And even if those targets are attained, the higher yields will be certainly absorbed by progressively increasing requirements of our agricultural strategy. For this and other cogent reasons, every Queensland food producer is urged to make his individual production figure for 1944 a record.

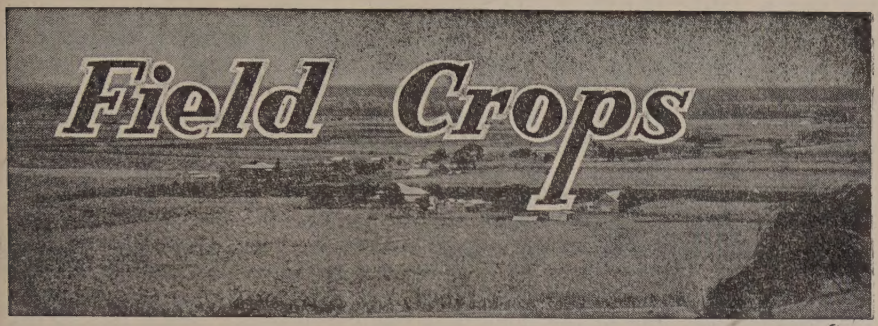
Food a Munition of War.

Food may be regarded as a munition of war; and especially in the closing stages of the war food supply will become of increasing importance. The greater the fighting force in the South-West Pacific, the shorter will be the war with Japan. So, obviously, Australia's capacity for essential food production will be a big factor in determining the effective fighting strength of the Allied Forces.

Then, again, food is required for the people of Britain who have suffered more than any other people, except those in enemy occupied countries. And food will not only win this war, but will be one of the most important factors in planning for a just and lasting peace.

Normally, Australia's food production is high, but the demands on it now are heavier than ever. For example, Britain's present meat requirements are greater than our pre-war shipments to the British markets. Before the war, we were bigger exporters of food than is commonly known. Australia was the third greatest wheat exporter, the second greatest meat exporter, the third greatest butter exporter, almost the world's greatest dried fruit exporter, the second greatest canned food exporter, Britain's third largest supplier of barley, and Britain's largest individual supplier of eggs. For most of these and some other commodities, we looked to Britain as our principal and most profitable market. Notwithstanding a change in fiscal policy in 1932, Britain continued to give some measure of preference for Australian products. And just before the war Britain arranged to take all Australian surplus food products, and this enabled us to plan our production with the confidence that an assured market gives. Our obligation to Britain, apart altogether from the natural obligation of kinship and participation in a common cause which we proudly acknowledge, is, therefore, very plain.

Yet, we cannot meet the increasing demands on our food resources unless we attain a record level of production in 1944. As far as Queensland producers are concerned, in the campaign for greater food production they may count on the continued co-operation of the Department of Agriculture and Stock, and on the assurance that everything possible will be done to find practical solutions for the difficulties in the way of attainment of our production objectives. To this end, the Queensland Government is co-operating actively with the Federal Government and the food control authorities. Satisfactory progress has already been made, and it is my belief that when plans now formulated are fully applied most of the major difficulties will be removed.



Haymaking.

L. M. HODGE.

IN converting a green crop into hay, the objective is to obtain the greatest possible weight of cured material of high nutritive value and attractive aroma without undue loss of colour or palatability. To attain that objective the crop should be of a suitable variety or varieties, free from deleterious weeds, well grown, cut at the right stage, and properly cured.

The stage at which a crop should be cut for hay is shortly after flowering commences, for if harvested in the early flowering stage the crop yields the maximum amount of dry matter of high nutritive value. If the crop is cut too early, the maximum yield will not be obtained, although the nutritive value is particularly high. On the other hand, if cutting is delayed until the ripening of the seed has advanced, the nutritive value of the resultant hay will be appreciably lowered because of increase in woody materials at the expense of proteins and of a decline in digestibility. Oats provide an exception to the general rule, in that they are best cut when a proportion of the seed at the top of the seed-head has ripened and the bulk of the seed is still in the late dough stage.

The method of curing depends on whether the material is coarse or fine, whether it is cut with the reaper and binder or with the mower, and the time of the year at which the crop is harvested. Binding the crop and stooking the sheaves protects the material from damage by rain, preserves the colour by avoiding excessive exposure to sunlight, and reduces losses due to rough handling. Winter-grown cereals are readily cured in this way, but summer crops, when so treated, require careful watching because of the danger of mould development in the centre of tightly-bound sheaves in warm, humid weather.

In curing loose hay, rough and too frequent handling should be avoided to prevent serious loss through the breaking up and powdering of the more nutritious portions of the plant, such as the small leaves and fine terminal parts generally. Losses of this kind are also caused by allowing the hay to become dry and brittle before being put into cocks. These losses are particularly heavy when leguminous crops, such as lucerne, are being handled.

Effect of Weather on Quality.

Naturally, the weather at haymaking time is of vital importance to the quality of the product. While risks cannot be avoided entirely, the farmer usually acquires a degree of weather sense from experience of

his own locality, and he should endeavour to arrange his haymaking to coincide with fine weather. Wet weather will rapidly spoil a crop cut for hay, as the material contains nutrients which are easily dissolved by water and so readily washed out during rain. Excessive drying and exposure to the sun should also be avoided, as they cause loss of green colour and shattering and loss of the valuable leafier parts of the plants.

The best cured hay results from a fairly rapid drying. Evaporation of moisture is facilitated by high air temperatures, sunshine, and wind, whereas high atmospheric humidity retards loss of moisture from the cut crop. If the weather is mild and windy, curing of loose hay in the windrows may be sufficiently thorough to reduce the moisture content to the desired level, and at the same time yield a fragrant, green hay in the stack. On the other hand, if the weather is hot and the atmosphere dry, or if rain threatens, the swaths should be raked and put into cocks as soon as practicable.

Hay should be stacked or baled before it becomes brittle, otherwise serious losses will occur because of shattering and powdering; and, in addition, the chaff made from dry hay contains an undue amount of irritating dust. If stacked or baled when too damp, however, the hay will heat, develop moulds, and spoil. In cereal or other grassy hays, the upper nodes or joints of the straw should be dry before the hay is put into stacks or bales. Where the hay is stooked, a sample for examination before stacking or baling should be drawn from the inside of a central sheaf, and, where the hay is loose, from the inside bottom of a cock. Various moisture tests for lucerne hay are described in a Departmental leaflet on lucerne-growing.

Coarse salt may be sprinkled over the layers as they are built into the stack. This increases the palatability of the hay.

Haystacks should be well built according to the directions given later in this article; they should be situated above flood-level, and protected securely against rain, fires, and vermin. While hay will keep for several years if properly stacked it deteriorates with age, and it is a good plan to feed or otherwise dispose of stacks when they are three years old, replacing them with new hay.

Hay may be baled as an alternative to stacking, and in this form it is easily handled, transported, and stored. Baled hay is the only form of hay for which a large demand exists in the produce market. Care must be taken that hay baled direct from the field is sufficiently cured, otherwise heating may occur under high pressure and the product be ruined.

CROPS SUITABLE FOR HAYMAKING.

Crops used for hay purposes in Queensland may be divided for convenience into summer-grown and winter-grown crops. The former comprises Sudan grass, saccharine sorghums, Japanese millet, white panicum, giant setaria, lucerne, and cowpea; while the main winter-grown crops are wheat, oats, barley, canary seed grass, field pea, and vetches or tares. In addition, native and cultivated pastures are at times harvested for hay, and occasionally the peanut is used for the same purpose. The most valuable hay crop is lucerne, which persists for a number of years, produces several cuttings each season, and yields a hay of high nutritive value. Of the annual hay crops, Sudan grass and wheat are the most important. Japanese millet, white panicum,

and giant setaria do not yield as heavily as Sudan grass but are better dual-purpose crops, in that they may be grazed at any stage of growth without danger to stock.

The sowing of either summer-grown or winter-grown hay crops should always be preceded by a period of bare fallow, during which weeds are eliminated, moisture is conserved, and soil fertility is improved by decomposition of organic matter. A gradual working down of the land to a fine tilth should be aimed at, but care should be taken not to expose the land unduly to the erosive action of water. Finally, the preparation of a fine, firm seed-bed to assure a rapid, even germination of the seed is essential.

In the drier inland agricultural areas, where soil moisture is the principal limiting factor to crop growth, ploughing should be completed several months in advance of sowing. In districts where the rainfall is more regular and abundant, later ploughing and consequently a shorter fallow period may be adopted. The fallow period, however, should always be sufficiently long to assure that a proper tilth is achieved by sowing time.

Summer-grown Crops.

The time of sowing of annual summer hay crops should, if possible, be so arranged that these crops, which are usually ready for cutting in six to nine weeks, do not reach that stage during the height of the summer rains. Lucerne should be sown in April or May.

Plate 1.
Harvesting a Crop of Sudan Grass in Central Queensland.

Sudan Grass.

Sudan grass is normally a hardy annual, although it may persist for two or even three seasons under frost-free conditions; nevertheless, it is generally unprofitable to persist with a crop of Sudan grass beyond a single season. Thick-stemmed plants of Sudan grass are difficult to cure, and it is advisable, therefore, to make a heavy sowing of seed in order to induce the production of a fine-stemmed crop. The seed is preferably drilled, using every grain run, at the rate of between 10 lb. and 12 lb. to the acre, but it may be broadcast at the rate of 20 lb. to the acre and covered by harrowing.

The crop (Plate 1) may be cut with the reaper and binder, in which case the sheaves should be put immediately into small stooks permitting free circulation of air around the sheaves. A very succulent crop tied by the binder may spoil in the sheaves, no matter how carefully it is cured, and such a crop is best harvested with a mower or with a reaper, the bundles in the latter case being tied by hand after wilting has occurred. If cut with the mower, the crop should be wilted in the swath and in the windrow and further cured in cocks, which should be of small size if the weather is cool or cloudy.

Sudan grass at all stages before flowering is regarded as potentially dangerous to stock, but the cured hay, made from a crop which has just flowered, is generally considered to be safe as a stock food. The regrowth should not be cut for hay until the crop has once more flowered.

Saccharine Sorghums.

The saccharine sorghums are grown almost entirely for green feed or for silage, since they are difficult to handle and to cure as a hay crop. If sown for hay, broadcasting of the seed is preferable to sowing in drills, since a more slender type of plant will be developed. The sowing rate should be between 15 and 20 lb. to the acre. They are best cured in bundles in the field and stacked subsequently on end in a slanting position. They make a very coarse hay, which should be chaffed before being fed to stock; even when chaffed, however, the hay is very hard on the mouths of the stock to which it is fed and has little to recommend it.

Millets.

The millets, including white panicum, and giant setaria are quick-growing, hardy annuals, which are able to make satisfactory development under fairly dry conditions. The seed should be drilled or broadcast at the rate of 10 lb. to 15 lb. to the acre. Because of their succulent nature, the millets take longer to cure than giant setaria, but they make excellent hay when they are cured. White panicum makes a particularly fine hay. All of the group have a free-seeding habit and, if allowed to mature their seed before being cut, may cause a lot of trouble in succeeding crops. If they are cut in the flowering stage, however, no trouble is experienced. A crop cut before maturity will usually make a second growth useful for grazing.

Lucerne.

The culture of lucerne for hay purposes is described in a Departmental leaflet on lucerne-growing, and only a general outline of the haymaking process is given here. Probably no other hay crop requires such skill and attention to detail during the curing processes as does lucerne. Lucerne hay, to command the highest price on the market, or to be of greatest value to the grower as a form of conserved fodder, should be bright-green in colour, fragrant, and contain a large proportion of leaf. It should be free from weeds and rubbish and contain a minimum of dust or other irritating matter. The principal mistakes causing losses in yield or in quality are cutting too early or too late, not curing sufficiently, and over-curing.

The crop should be cut in the early flowering stage. If cut earlier, the maximum tonnage is not obtained, and if cut too late much of the lower leaf is lost, the stems become woody, and the quality of the hay suffers accordingly. In addition, late cutting delays the growth of the succeeding crop and may result in the loss of one cutting during the

season. Lucerne should be cut with a mower, as it is too succulent to admit of being bound and stooked. If the crop is wet from dew or rain, cutting should be delayed until the surface moisture has evaporated.

In fine weather, the swath may be raked into windrows two or three hours after cutting. The operation should not be delayed until the plants have become dry and brittle, as they may then lose sufficient leaves to lower seriously the quality of the hay. The windrowed material, further, should be put into cocks before the leaf is dry enough to shatter. To obtain the maximum shading with the freest circulation of air and to protect the cocked material from rain damage, the cocks should be built tall and narrow. It is advisable to inspect the cocks each day while curing proceeds and to open them if mould development threatens. Sometimes the top half of the cock is lifted off, placed on the ground, and the bottom portion inverted on it. In fine, hot weather two days in the cock should be sufficient, but this period may be extended to four days if the weather retards moisture evaporation.

The cocks should not be stacked until the moisture content of the lucerne is reduced sufficiently to prevent spoilage in the stack. The lucerne hay should be stored in a shed, but if it is necessary to stack it in the open the stack should be protected from rain, otherwise some wastage will occur.

Cowpea.

The cultivation of cowpea is described in a Departmental leaflet. The hay is rather difficult to cure satisfactorily, because of the different rate of drying of leaf and stem. If allowed full exposure to sun and wind, the leaves dry progressively from brittle-green to brown and finally drop off while the coarser stems are still moderately succulent. To counteract this, it is necessary to select a fine-stemmed variety and to sow broadcast at the rate of 30 to 50 lb. per acre, with the object of inducing the development of fine stems. The sowing rate will, of course, depend on the size of the seed of the selected variety. Victor and poona are the most suitable varieties for hay purposes, both being relatively fine-textured and capable of producing heavily.

The art of curing the crop lies in inducing the leaves to retain their normal function sufficiently long after cutting to drain the moisture from the stems. This is done by judicious cocking as soon as practicable after cutting, in order to prevent the leaves from withering while the stems are still sappy. The crop should be cut with the mower when the pods have become fully developed, but before they commence to ripen. It should be turned frequently, if the hay is being made on the coast, before being put into cocks which should be tall and narrow to permit as free circulation of air as is possible. In drier inland districts, such as the Callide Valley, and on the Darling Downs, however, during hot sunny weather the crop may be put direct into very small cocks from the swath after a few hours of wilting. As drying proceeds, the cocks should be made larger by inverting one on top of another, repeating the process until each cock consists of three or four of the originals. They should be as tall and as narrow as possible. Before stacking the cocks, the stems should be carefully examined for excessive moisture. Under good growing conditions, a yield of 2 tons to 4 tons of hay per acre may be expected.

Winter-grown Crops.

The cereals—wheat, oats, barley, and canary seed grass—may be planted over a wide period, but mainly from March to June, although

canary seed grass sowings may be made satisfactorily as late as August. The best harvesting months for cereal hay crops, however, are August and September, and it is advantageous to arrange the main sowings to mature for hay during those months. Varieties differ a good deal as regards the time required to reach the early-flowering stage. Early, i.e., quick maturing varieties may be ready to cut in three months, while late, i.e., slow maturing, varieties may require about four and a-half months; so that an early wheat should be sown in June for harvesting in September, while a late variety would need to be sown in April or May. May is the best month for general sowings to be made.

Winter-grown leguminous hay crops should be sown in early autumn, as it is desirable that they be harvested before they suffer a setback because of dry conditions during the spring months.

Wheat.

Wheaten hay is usually converted into chaff before being marketed or fed on the farm, and the aim in haymaking is to produce a hay which will yield a good quality chaff. The principal factors controlling the character of the hay are season, soil husbandry, curing practices, and variety.

To be of good quality, wheaten hay should be made from a well-grown crop, and it is advisable, therefore, to cut the main hay supplies in good seasons rather than in poor seasons. Loamy soils of high fertility produce a hay of good body and of high nutritive value; while poor, light soils often develop a crop curing into a light, inferior hay. Cultural practices should aim at the provision of favourable soil conditions and the elimination of weeds.

The ideal variety of hay wheat should possess certain characters which are not of primary importance in a grain crop. It should be capable of heavy production of green material, possess a stout-walled straw which will cut into a clean, heavy chaff, have straw and flag of a brighter green colour, and be devoid of awns and dark-brown coloration of the ears. Further, the variety should possess a high degree of resistance to stem and leaf diseases. The main hay varieties in use in Queensland are Clarendon, Warren, Florence, and Warchief.

The general rule in regard to rate of sowing is that a lighter rate should be used where soil moisture is likely to be deficient at some stage of the growth of the crop than where ample soil moisture is available. The sowing rate for a hay crop is heavier than that for a crop sown for grain, since a longer straw is desired. The available moisture will usually support the denser plant population, because the hay crop occupies the land for a considerably shorter period than does a grain crop. The average sowing rates recommended for sowing from April to mid-May are 45 to 55 lb. per acre, and for later sowings, 55 lb. to 65 lb. per acre.

The period required for germination of the seed in a warm moist soil is five or six days, and the depth of planting should be sufficient to ensure that the seed is in contact with moist soil for that period. In most soils from 2 inches to 2½ inches is a suitable depth, but the seed should be planted deeper if the soil is likely to dry out to a depth of 2 inches in a short time.

The grazing of wheaten hay crops in Queensland is not recommended, except where a rank, sappy growth is developed by the young crop. Grazing may safely be practised only when the crop is in the grassy stage and before the seedheads commence to form inside the leafy shoots. If the shoots containing the developing seedheads are grazed off, subsequent growth of the plant is mainly from less advanced shoots, and a good hay crop is not formed. The presence or absence of the miniature seedhead may be ascertained by splitting open some of the most advanced leafy shoots.

The correct time to cut wheat for hay in order to obtain the maximum yield, consistent with high nutritive value, is not later than eight days after the wheat crop has flowered. Cutting with the reaper and binder not only effects a saving of labour, but also favours the production of a hay of good quality. At least two rounds should be cut before the outside of the crop which has been trodden by the horses, is harvested. If portions of the crop are to be left for grain, firebreaks may be formed by a judicious choice of the areas harvested for hay.

The sheaves should usually be large and firmly bound, as this ensures that a large proportion of the hay is protected from the bleaching action of the sun. If the crop is sappy, small sheaves are advisable in order to guard against mould development. The sheaves should be stooked as soon as possible after cutting, and it is a good practice to have the stooking gang keep pace with the binder. For this purpose, one man per ton of hay per acre is necessary if the reaper and binder is in operation all the time. The average number of sheaves which should be placed in a stook is twenty, but a lesser number is desirable if drying conditions are not good. The long, narrow type of stook is considered preferable to the round stook in the wetter districts.

Sheaved hay cured in stooks is usually ready for stacking in about fourteen days, but this time is only approximate and the hay should be stacked as soon as the upper joints of straws drawn from the middle of the sheaves are dry. Over-exposure of the sheaves in the stooks tends to make the hay hard and brittle, with a lowering of the quality of the chaff.

When hay is being chaffed for marketing purposes, all mouldy or inferior sheaves should be discarded, and the chaff placed in clean, sound bags neatly branded. If chaffed in very hot, dry weather, wheaten hay tends to shatter and powder. It is advisable, therefore, to cut the chaff in humid weather or, when practicable, to apply high-pressure dry steam to the hay as it is being chaffed. The blades of the cutter should be kept sharp and should run close against the face plate, otherwise the chaff will be broken, uneven, and unattractive.

Oats.

Although oats are widely grown for grazing and green fodder in Queensland, the amount of oaten hay produced is small, and very little local hay is marketed. The crop tends to be somewhat coarse and rank in Queensland and is liable to lodge during wet weather but its main disability is the susceptibility of the varieties in use to rust.

Oats may be sown from February to June, but it is usually desirable to sow during the March rains in order to secure a cutting for hay in late August or during September, when the weather is favourable for haymaking. In the southern districts, a long-season variety, such as

Algerian, if sown early, will usually give a winter grazing and a hay cut in the spring. Early maturing varieties, such as Sunrise, Mulga, Belar, Buddah, Fulghum, and Palestine, are preferable in the central district, where the spring is usually extremely dry.

The rate of sowing varies between 40 and 80 lb. per acre when drilled, with somewhat heavier sowings when broadcast. Lighter sowings give a greater margin of safety under dry conditions. Coarse-stemmed varieties should be sown at a heavier rate than fine-stemmed varieties in order to reduce the thickness of the stems.

As with wheat, grazing should not be permitted except on rank-growing crops, and then only during the tillering stage. Less vigorous crops should not be grazed, and stock may destroy an undue proportion of plants on loose, open soils by pulling them out of the ground.

The proper stage at which oats should be cut for hay is when the bulk of the seed is in the late dough stage. This is indicated by the top seeds on the seedhead turning white. The chief reason for delaying the cutting of oats for hay until after flowering has ceased is that chaff buyers prefer oaten chaff containing grain. The purplish-green colour of chaff prepared from oaten hay cut in the late dough stage is taken by buyers as an indication that harvesting was done before the seed ripened and shattered.

The curing of oaten hay and its conversion into chaff follow the practices adopted in the case of wheaten hay and chaff.

Field Pea.

The field pea gives best results as a hay crop when grown on fertile, well-drained soils in districts where ample winter rainfall and mild spring conditions usually prevail.

If sown alone, about 60 lb. of seed to the acre is generally used, care being taken to plant fairly deeply, between 2½ inches and 3 inches being the best depth at which to sow.

Although the field pea is a hollow-stemmed plant, the hay is rather difficult to cure. In general, the directions given for the curing of lucerne hay should be followed. The field pea is more easily harvested and cured when sown in admixture with oats or wheat than when sown alone. Because the pea seed germinates better at a slightly greater depth than is usual for the cereals, the former should be sown first. An average planting rate is 20 lb. of field pea to 40 lb. of wheat or oats. Lighter sowings than these are preferable where growing conditions are likely to be unfavourable.

Vetches or Tares.

The climatic range of vetches or tares is similar to that of field pea. They make an excellent hay and are more easily cured than is field pea; nevertheless they are but little used in Queensland. As a hay crop, they are best sown with a strong-stemmed wheat which serves to keep the vetches or tares off the ground and also facilitates harvesting. The legume and cereal seed are best sown separately, at the rate of 20 lb. of vetches or tares to 40 lb. of wheat per acre. When vetches or tares are grown with wheat, the usual practice is to cut the mixture when the wheat has reached the correct hay stage, although at this time the legume generally has not commenced to flower.

Plate 2.
WHEAT AND VETCHES.

PASTURE HAY.

Conservation in the form of hay of excess growth produced by pastures during the summer growing season is practised to some extent; and occasionally, after a good winter, hay is made from certain winter-growing pasture plants, such as prairie grass and ryegrasses. The most

Plate 3.
A WELL-FILLED HAY SHED.

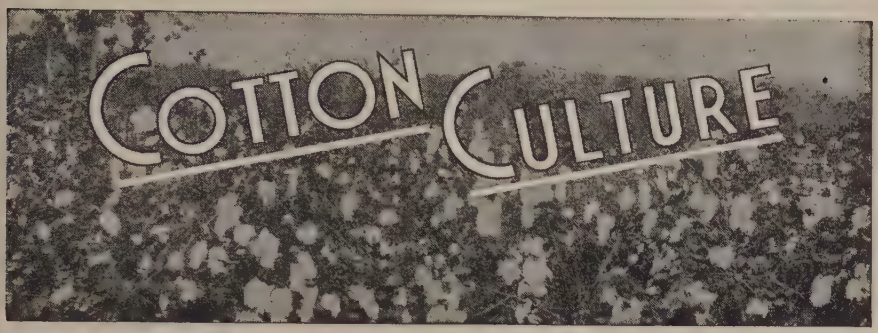
productive of the pasture grasses utilised for hay is Rhodes grass, a native of Africa, widely used in Queensland as a pasture. Many of the native grasses make a satisfactory class of hay if cut at the proper time, correctly cured, and securely stacked. The chief of these are the various blue grasses, star grasses, Mitchell grasses, and Flinders grasses, most of which often occur in almost pure stands. It is advisable to utilise for hay only pastures growing on good soils, as these may be expected to comprise the more valuable grasses, to yield well enough to repay the cost of haymaking, and to be of satisfactory nutritive value.

The correct time for cutting pastures for hay is during the flowering period, and as this stage may not occur more than once during a year and is then very brief, only a very short space of time is available for harvesting. Native grasses outside the wet tropics usually possess much fine leaf matter, from which nutrients may easily be lost by improper curing. The swaths should be raked into windrows immediately after cutting. If the weather is sunny and windy, the hay may be stacked direct from the windrow, but in very hot, dry weather the period of curing in the windrow should be materially reduced and the hay put into cocks in order to prevent excessive drying and powdering. It is essential to stack the hay as soon as it is ready, otherwise deterioration through over-exposure will occur. A liberal sprinkling of coarse salt on each successive layer when stacking will improve the palatability of the hay. Stacks should be protected from rain by a galvanised iron roof.

[TO BE CONTINUED.]

Plate 4.

THE GRAIN IS IN THE BAG.—Time for a "blow" on a Queensland wheat farm.



Trials of Rotations with Cotton at the Biloela Research Station.

W. A. R. COWDRY, Acting Manager, Biloela Research Station.

SINCE the establishment of the Biloela Research Station in the Callide Valley in 1924, the merits of various cropping rotations for the district have been investigated at that centre. The soils at the Research Station consist of the usual range of sandy loams to clay loams typical of most farms on the alluvial flats adjacent to the creeks in the district. The investigations in cotton rotations herein summarised were conducted on the heavier dark-grey clay loams originally timbered with a mixture of red gum, large box, and ironbark trees. These soils are well supplied with the plant foods required by fodder crops and cotton. It is believed, therefore, that the results obtained are applicable to the loams and heavy clay loams of both the forest and scrub series in most of the cotton-growing districts south of Mackay.

No.	Rotation.	No. of Years of Cotton Yields.	Gain in Seed Cotton per Acre over Corresponding Controls.	% Increase in Yield.
			Lb.	
1	Cotton–Sudan grass	10	38	8·85
2	Cotton–Sorghum..	11	5	1·09
3	Cotton–Giant setaria	7	45	10·14
4	Cotton–Maize	11	25	5·45
5	Cotton–Peanuts	5	—18	—2·23
6	(Cowpeas–Wheat), Maize, Cotton	5	131	26·80
7	(Fallow–Oats), Maize, Cotton ..	3	6	1·11
8	Giant setaria–Cotton–Cotton—			
	Cotton in 1st year	8	133	34·54
	Cotton in 2nd year	8	78	20·47
9	Rhodes grass (3 years) Cotton–Cotton–Cotton—			
	Cotton in 1st year ..	6	9	1·95
	Cotton in 2nd year ..	4	163	24·23
	Cotton in 3rd year ..	3	111	22·76

At the time of the inception of the Research Station, the Callide Valley was pastoral country newly opened for closer settlement, and it was generally considered from the experiences of farmers in adjacent districts that cotton growing, in conjunction with dairying, would be the basic industries practised in the new settlement. Accordingly, most of the rotations first studied consisted of a fodder crop grown in rotation

with cotton, although cash crops such as peanuts and potatoes were also included. As the results from these rotations became available, a better understanding was obtained of the problems involved in cotton growing and modifications of the programmes were made, so that the various rotations have been of different duration. It is believed, however, that each rotation has been tested over a sufficient number of seasons to yield results indicative of its merits.

The results obtained from the various rotations tested are presented in the following table. In each case the average yield of seed cotton produced in the rotation is stated as a gain or loss over the average yield obtained from the companionate cotton following cotton "control" plots and is also expressed as a percentage of the average yield of the control plots, thus making the results comparable.

The following notes have been compiled from observations made and results obtained in the various rotations mentioned in table on page 17.

No. 1.—Cotton cropped alternately with Sudan grass has given slightly better yields than the control plots continuously planted to cotton. The difference between the two rotations has always been larger in a season with low mid-summer rainfall, when the "control" plots have suffered more severely during the stress periods.

No. 2.—Cotton cropped alternately with sorghum has given no consistent increase in yields in more sandy soils, though on the Station, where similar rotations were established, considerable gains of cotton have been obtained in some seasons. Saccaline has been used as the sorghum crop in the majority of the tests of this rotation, but grain sorghum varieties have been substituted recently, in view of the interest being taken in this crop in the district.

No. 3.—Giant setaria (giant panicum) was selected for trial in the rotations because of its ability to produce a profitable crop of hay quickly, thus providing an opportunity to plough under a fair amount of stubble during the early autumn. This fodder crop has, like Sudan grass, proved to be of greater value in increasing the yield of the following cotton when the latter crop experienced a dry season, more especially if heavy yields were obtained from the fodder crop.

No. 4.—The yields of cotton grown alternately with maize have mostly been similar to those in other rotations with fodder—*i.e.*, slightly improved yields were obtained.

No. 5.—This cotton-peanuts rotation was discontinued when it became very evident that peanuts or any other legume markedly promoted rank growth in the following cotton crop, such growth being accompanied by poor yields.

No. 6.—A rotation in which cowpea, wheat, and maize preceded cotton in that order—the four crops being grown over three years—was studied for five seasons. The two grass crops following the legume were apparently able to reduce sufficiently the additional nitrogen provided by the cowpea to levels favourable for cotton as a mean gain of 131 lb. per acre was secured over the control. A variation of this rotation may be useful on the less fertile soils of the forest series.

No. 7.—In this three-year rotation, oats was planted after a summer bare fallow and was followed by maize and then cotton. Poor seasons were encountered in the first two of the three seasons during which it was carried out and yield increases in seed cotton were practically nil. Because of the expense incurred in maintaining a bare fallow throughout the summer, this rotation was discontinued.

No. 8.—In this rotation two crops of cotton followed a single crop of giant setaria. As would be expected from similar rotations with fodder crops, appreciable gains were obtained only when the cotton following giant setaria was grown in relatively dry weather.

No. 9.—The rotation in which cotton is planted for three seasons following a three-year growth of Rhodes grass has been in progress for several years, both in these series and in a number of other tests on the different soil types on the Research Station, and has proved to be consistently sound. In the first year following the break-up of the Rhodes grass, the growth of the cotton and also the yield from the crop may be depressed if the grass is not ploughed before June or July. This effect is apparently due to a temporary lack of nitrates in the soil. The average yield in the first year after Rhodes grass over this series of tests was markedly reduced by a very adverse result obtained in one season. In most seasons, appreciably higher gains over the controls were produced, as was also true in tests on the other soil types on the Research Station. However, the second and third crops of cotton have given consistently high returns, the gains being greatest when the poorer sandy clay soils of the Research Station are considered separately.

The results of investigations conducted over several years have appeared to indicate that the beneficial effects obtained in a Rhodes grass-cotton rotation are due to the more permeable surface soil in the cultivations after ploughing a three years' stand of Rhodes grass. Efficient penetration of storm rains is thus secured, and this provides the cotton crops with sufficient moisture to withstand all but severe prolonged dry periods. In addition, a balance of plant foods more favourable for the production of profitable crops of cotton is maintained in the soil by this Rhodes grass-cotton rotation than in any of the other rotations tested.

The results obtained in the tests have demonstrated that where cotton is grown in alternate rotation with some form of fodder crop, the gains realised in the cotton have not been satisfactory and in some seasons the yields of the fodder crops have been unprofitable. Likewise, where cotton has followed two fodder crops preceded by croppings which provided subsoil moisture and additional nitrogen for the fodder crops, the cost of production of the fodder crops has made the returns realised unprofitable when compared with those obtained from the cotton-Rhodes grass rotation. Where cotton has been grown for three seasons following three years' growth of Rhodes grass, better yields of cotton have been obtained than in the other rotations tested, and, in addition, a satisfactory amount of grass for either hay-making or grazing has been cheaply produced. It is recommended, therefore, that all cotton-growers investigate thoroughly the merits of this rotation on their properties.

Marketing Plums.

JAS. H. GREGORY.

IN recent years, growers have developed plum varieties, which have shown great improvement in quality. This development and improvement have placed the trade in this fruit on a very firm foundation. No longer is the plum considered as just another jam fruit. It is now accepted as one of the choicest of the dessert stone fruits.

Although careful handling and care is necessary when sending in plums for factory use, it becomes absolutely essential to take every precaution to prevent damage when plums are being harvested and packed for the fresh fruit market. Even minute skin injury may mean increasing the risk of brown rot development, which would result in the subsequent breakdown of the fruit and heavy loss.

Maturity.

One of the most important considerations with all stone fruits is correct maturity at the time of harvesting. With plums, if consignments are to travel long distances, it is necessary to use every care in the selection and harvesting of fruit. Stone fruits are best left to ripen as much as possible on the trees. Because of the long distances the Stanthorpe district is from many of the points of disposal, it is not possible to market tree-ripened fruit successfully. Plums have, therefore, to be harvested when fully matured but not ripe. The ground colour of the fruit is the best indication of maturity. If plums are to be sent long distances, lesser coloured fruit is selected, the more highly coloured specimens being used for the nearer markets. Before harvesting, plums should show a pronounced development of colour. Coloured and dark varieties should be showing at least one-third colour development. The maturity of the light varieties is indicated by the change in the ground colour of the skin from a dull green to a brighter translucent yellow green or full yellow colour, according to the variety.

Plums harvested while still too green will not ripen satisfactorily in any circumstances. It is a greater fault to market under-matured fruit than over-matured fruit. Both cause slow sales in the market and tend to cause stagnation, but immature fruit has the added disadvantage of causing, through its unpalatability, consumers to lose their taste for that particular fruit and a consequent lessening of the demand.

Harvesting.

The plums should be allowed to develop to a satisfactory degree of maturity before being taken from the trees. Baskets or specially made

picking containers should be used. A satisfactory picking bucket can be made from a kerosene tin cut lengthways and fitted with a handle, or with a strap to hang over the shoulder. The plums should be carefully placed in the picking container and the same care taken when transferring the fruit to the orchard boxes. The boxes should be carefully placed on the shady side of the trees to protect the fruit from the heat of the sun. The orchard boxes should be transported to the packing shed as soon as possible after being filled and there stacked in a cool place with spaces left for cool air to flow between the boxes. When the fruit is cool, packing may be commenced. If these precautions, however, are not taken and the plums packed while still warm, the fruit will sweat and tend to generate heat, which will cause premature ripening and a condition favourable to the growth of fungous diseases, thus greatly lessening the life and transportable distance of the fruit.

If serious loss during transport is to be avoided, the greatest care should be taken to prevent skin abrasions. Never at any period of operations should fruit be thrown or dropped into cases or picking utensils. Picking bags are not recommended, except for use in harvesting the hard canning varieties, and even then the utmost care should be taken to avoid damage.

Transit Troubles.

One of the greatest difficulties in the way of successful marketing is the fungous disease of brown rot. This disease attacks the plums during the ripening stage. If weather conditions are favourable for its development, fruit may be affected while still on the trees. The fruit also becomes more susceptible to development of this disease after it is packed in the case. As any injury to the skin facilitates the attack of this disease it can readily be understood that care in handling, while harvesting and packing, is absolutely necessary.

Many fungal troubles are caused by infections present in packing sheds. Growers are, therefore, most strongly advised to take all precautionary measures necessary to keep their packing sheds clean.

Packing Shed Hygiene.

Sheds should be kept cleared of all rejected fruits. They should, in no circumstances, be allowed to contaminate floors, fittings, or cases, because of being allowed to rot. Rejected fruit should be immediately dumped in a pit kept for that purpose.

The shed and implements should be cleaned and disinfected periodically. This may be done by using a solution of "Shirlan" watered on floors. Sizing machines may be rubbed over with the same solution.

If second hand cases are used, they should be inspected for any contamination residue caused by old fruit having gone bad when the case had been previously used. Treatment with "Shirlan" will give added protection against contamination.

Containers.

The most satisfactory case for use is the half-bushel dump case—18 inches long by 7⅛ inches wide by 8⅔ inches deep, internal dimensions. Under wartime conditions, growers may have to use other types of boxes, such as the standard half-bushel—18 inches long by 11¾ inches wide by 5¼ inches deep. These cases can be packed and made to look attractive. No matter which container is used, it is recommended that cases be made up with the openings between the boards of the top, bottom, and sides eliminated as far as possible.

Packing Material.

It is preferable to line all cases when packing fruit for market. This gives the tender skins of the fruit the protection necessary to prevent marking by pressure on the rough grain of the boards.

The use of special wrapping paper, recommended where plums are to be sent long distances, or corrugated cardboard linings for lids, bottoms, or sides while desirable will, of necessity, have to be dispensed with for the duration of the war.

Preparing to Pack.

The standard diagonal pack is recommended. For this pack it is advisable for the fruit to be sized. This can be done either mechanically or by hand. Growers will find that most modern sizing machines are suitable for handling plums, provided that care is used in their operation and servicing. To operate a sizing unit successfully, correct tension should be kept on any conveyor belts, rollers should be adjusted to the heights most suited for any individual type of plum; screws should not be allowed to project and cause damage and ample padding should be placed where fruit is likely to come into direct contact with hard surfaces.

Hand sizing is best carried out during harvesting. Growers, by using a suitable picking container—such as a kerosene tin cut lengthwise or something made up of a similar shape—may rapidly size the fruit in the field. Three cases are placed side by side, the fruit being sized into three dimensions while being transferred from the picking containers to the cases. Large, medium, and small would be satisfactory; after being taken to the packing shed, each size may be placed together on the packing bench. Two sizes are packed from the bench, making, in actual practice, at least six different sized packs to the line of fruit.

Placing all the fruit in one heap and endeavouring to pack each size separately is the least satisfactory method of all. If circumstances make it necessary for this to be done, only one case should be placed on the bench at a time.

Grading.

If a good-brand reputation is to be maintained, grading for quality is necessary. All ill-shapen, gummy, cracked, calloused, poorly coloured, or damaged fruits should be excluded from A-grade packs. B-grade fruit should be sound and only placed on the market while payable prices are being received.

Packing.

Growers will find the diagonal system of packing is the easiest and most satisfactory method of packing plums. The principles will be easy to understand if a close examination of the illustrations is made.

A list of the packs for use in packing the dump half-bushel case is given. Many more are available to growers. For example: fruit packed with the 3-2 pack, which is shown as having six layers, may also be packed 3-2 with seven layers by placing less in each layer. As less fruit is placed in each layer it is easily understood how it is possible to get in an extra one. Other packs may be treated in the same way. The practice of using these other packs is not wrong and does not affect the reputation of a good brand. There are many types and varying shapes of egg- or heart-shaped plums, some pointed and otherwise, also nearly

round. It would not be possible to separate and give the packs for all types. Growers are advised, therefore, to use the packs which suit the particular types of fruit they produce, irrespective of whether they are given in the packing table or not. Using the diagonal pack is the thing to ensure that the fullest protection is given the fruit. Its advantages are—

1. No two plums rest one upon the other but are placed in the pockets of the layer underneath;
2. The height of the fruit in the case can be adjusted by altering the size of the pockets;
3. Fruit has a maximum display value, whether opened on the top or side.

The following table of counts is given:—

PACKS USED FOR PACKING PLUMS IN THE DUMP HALF-BUSHEL.

Case made up the narrow way 18 inches long by 7⅛ inches wide by 8⅔ inches deep.

EGG-SHAPED PLUMS.

Pond's Seedling, Giant Prune, Black Diamond, President, &c.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
1⅛	3–2	8 x 7	7	263
1¼	3–2	7 x 7	7	245
1⅜	3–2	7 x 6	7	228
1½	3–2	6 x 6	7	210
1⅝	3–2	6 x 5	7	193
	2–2	8 x 8	6	192
1¾	3–2	6 x 6	6	180
	2–2	8 x 7	6	180
1⅞	2–2	7 x 7	6	168
	3–2	6 x 5	6	165
	2–2	7 x 6	6	156
1⅞	3–2	5 x 5	6	150
	2–2	6 x 6	6	144
2	2–2	7 x 7	5	140
2⅛	2–2	7 x 6	5	130
2¼	2–2	6 x 6	5	120
2⅜	2–2	6 x 5	5	110
	2–2	5 x 5	5	100
2½	2–1	8 x 7	4	90
	2–1	7 x 7	4	84

HEART-SHAPED PLUMS.

Wilson's, Shiro, Burbank, Narrabeen, Washington, Angelina, Burbank Formosa, &c.

3–2	11 x 10	6	315
1⅛ 3–2	10 x 10	6	300
1¼ 3–2	10 x 9	6	285
1⅜ 3–2	9 x 9	6	270
1½ 3–2	9 x 8	6	255
1⅝ 3–2	8 x 8	6	240
1¾ 3–2	8 x 7	6	225
1⅞ 3–2	7 x 7	6	210
2 3–2	7 x 6	6	195
2⅛ 3–2	6 x 6	6	180
2–2	9 x 8	5	170
2¼ 2–2	8 x 8	5	160
2–2	8 x 7	5	150
2⅜ 2–2	7 x 7	5	140
2–2	7 x 6	5	130
2½ 2–2	6 x 6	5	120
2–2	6 x 5	5	110

PACKS USED FOR PACKING PLUMS IN THE DUMP HALF-BUSHEL CASE MADE UP THE WIDE WAY.

18 inches long by 8⅝ inches wide by 7⅛ inches deep.

EGG-SHAPED PLUMS.

Pond's Seedling, Giant Prune, Black Diamond, President, &c.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
1	5–4	7 x 6	5	293
	5–4	6 x 6	5	270
	4–3	8 x 7	5	263
1¼	4–3	7 x 7	5	245
	3–3	8 x 8	5	240
1⅜	4–3	7 x 6	5	228
	3–3	8 x 7	5	225
1½	4–3	6 x 6	5	210
	3–3	7 x 7	5	210
1⅝	4–3	6 x 5	5	193
	3–3	6 x 7	5	195
1¾	3–3	6 x 6	5	180
	4–3	5 x 5	5	175
	3–3	6 x 5	5	165
1⅞	3–3	5 x 5	5	150
	3–2	6 x 6	5	150
2	3–2	6 x 5	5	138
2⅛	3–2	5 x 5	5	125
2¼	3–2	6 x 6	4	120
	3–2	6 x 5	4	110
2⅜	3–2	5 x 5	4	100
2½	3–2	5 x 4	4	90

DUMP HALF-BUSHEL CASE MADE UP THE WIDE WAY.

18 inches long by 8⅝ inches wide by 7⅛ inches deep.

HEART-SHAPED PLUMS.

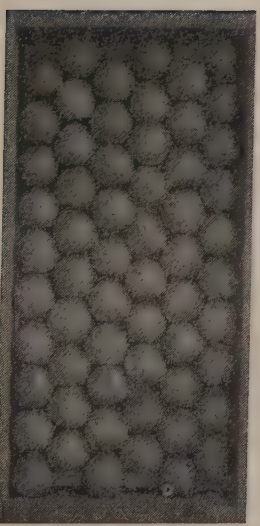
Wilson's, Shiro, Burbank, Narrabeen, Washington, Angelina, Burbank Formosa, &c.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
	5–4	9 x 9	5	405
	5–4	9 x 8	5	382
	5–4	8 x 8	5	360
	4–4	9 x 9	5	360
	4–4	9 x 8	5	340
1	4–4	8 x 8	5	320
1⅛	4–3	9 x 9	5	315
1¼	4–4	8 x 7	5	298
	4–3	9 x 8	5	290
1⅜	4–4	7 x 7	5	280
	4–3	8 x 8	5	280
1½	4–3	8 x 7	5	263
	4–4	7 x 6	5	260
1⅝	4–3	7 x 7	5	245
1¾	4–3	7 x 6	5	228
1⅞	4–3	6 x 6	5	210
2	3–3	7 x 6	5	195
2⅛	3–3	6 x 6	5	180
2¼	3–3	6 x 5	5	165
	3–2	7 x 6	5	163
2⅜	3–3	5 x 5	5	150
	3–2	6 x 5	5	138
2½	3–2	5 x 5	5	125
	3–2	6 x 6	4	120
2⅝	3–2	6 x 5	4	110
	3–2	5 x 5	4	100
2¾	3–2	5 x 4	4	90

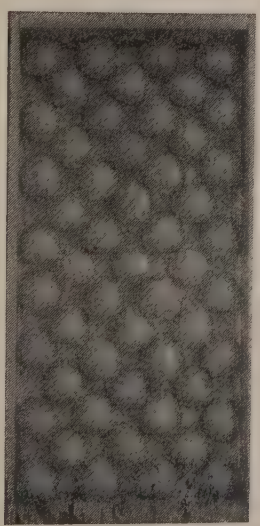
FINISHED CASE.

3–2 Pack. 7 Layers. 6 × 6 Layer Count. Total 210.
Plate 5.

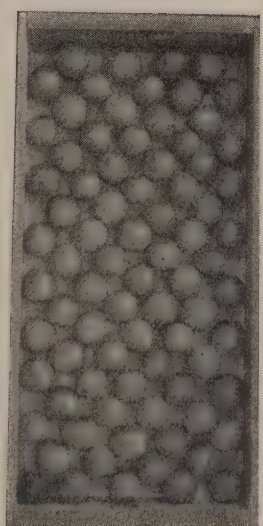
FIRST LAYERS.



3–3 Pack.



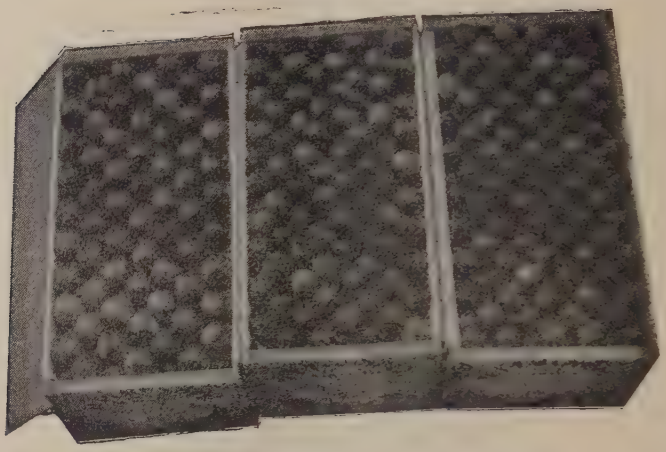
4–3 Pack.



5–4 Pack.

Plate 6.

FINISHED CASES.



4–3 Pack. 4–4 Pack. 5–4 Pack.

Plate 7.

STAYING STRAINER POSTS.

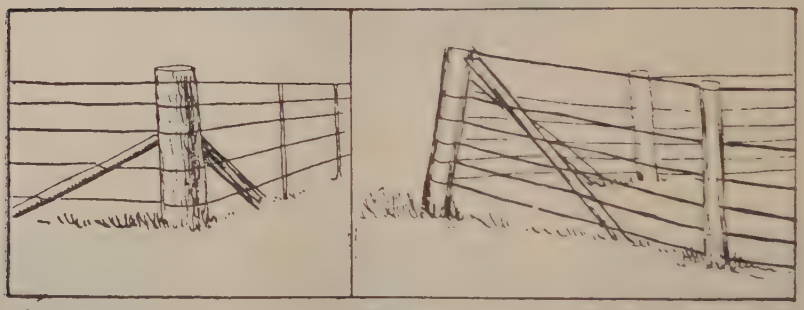


Plate 8.

These illustrations show right and wrong methods of staying strainer posts in a fence. Posts stayed from top are likely to be lifted out of ground, whereas those stayed at middle will remain rigid. Problem is one of mechanics, rather involved because of multiplicity of forces to be taken into account.

Wires tend to pull post over, direction of force they exert being more or less parallel with ground surface. Ground does not exert an actual force, but it offers a resistance, which is equivalent to a force butted against the post at the surface, and another helping force on the opposite side right down at the base of the post—3½ ft. underground.

These particular spots or areas are those where soil is compressed when the strain is put on wires. Direction of these forces is also more or less parallel to ground. Together they act in opposition to the pull of the wires. Next comes effect of stay. It does not exert an actual pull, but offers resistance which is converted by pull of wires into a force acting in direction of the stay itself upward.

Therefore, steeper the angle of stay, more upward its thrust, and greater the tendency to lift post out of ground. Ability of strainer to resist this upward pull depends upon the hold it has in ground.

When the stay is at the middle, it is not at such a steep angle—assuming stay to be of the same length as before—and upward thrust is less. Point where stay butts against strainer becomes a fulcrum, or pivot, so that strain of the bottom wires can be used to counter-balance pull of top wires. This lessens load or pull on ground.

Vegetable Production

The Choko.

C. N. MORGAN, Fruit Branch.

THE Choko is a popular vegetable grown in coastal districts in Queensland for market, and it is also an excellent vegetable for the home garden as the climatic conditions are most suitable. It is an herbaceous perennial creeper, resembling the climbing cucumber, and given satisfactory treatment is a robust grower in the warmer months of the year. During the cold weather of July and August the plant temporarily dies back.

While in growth the plant forms under the ground a large tuberous root, and it is from this that growth starts in the spring. This process, with good cultural treatment, will go on for many years, and therefore a grower must ensure, if he intends to grow chokos successfully, that his trellises are well constructed in order to last out the life of the plant. The Choko usually improves wtih age, and therefore during its years of high productivity the breaking down of a badly-constructed trellis is a severe loss.

Trellising.

A strong well-constructed trellis may be made with round timber. Various types of trellises are used, and those illustrated are satisfactory. They can be made as long as desired—say two to three chains. The method of constructing the trellis, shown in Plates 9 and 10, is to set the posts 2 feet 6 inches in the ground with 22 feet between them at ground level and at an angle to allow 15 feet at the top. The tops of the posts are cut level, and the inner corners trimmed, allowing the vertical check of the cross piece to fit tightly against the posts. (See Plate 9.) The height of the trellis is 6 feet. Twelve feet is allowed between posts on each side of the trellis, and the end posts should be well stayed. 12½-gauge wire is stretched along the trellis and attached firmly to the posts at intervals of approximately 15 inches.

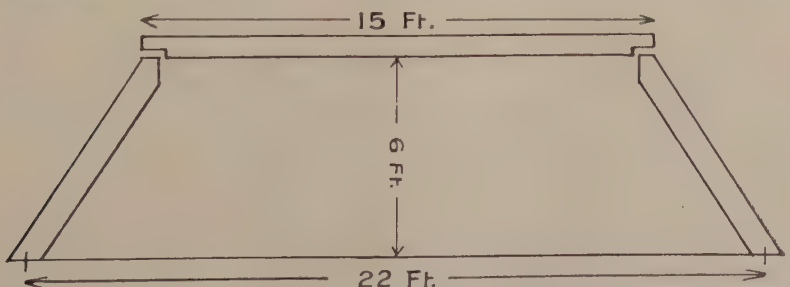


Plate 9.

Showing the Construction of Trellis Described in First Method.

Plate 10.
VINES ON TRELLIS BUILT BY FIRST METHOD.

Plate 11.
SHOWING TRELLIS BUILT TO SPECIFICATIONS OF THE SECOND METHOD.

In the second method two rows of strong posts are set vertically in the ground, with a height of about 6 feet, the rows being about 10 feet apart, and the posts about 9 feet apart in the rows. The tops of the posts support cross timbers, on which 12½-gauge plain wire is stretched allowing 15 inches to 18 inches between the wires. Stays support the posts, and wires are also stretched on these.

Planting.

The entire choko fruit is used for planting. Each fruit bears only one seed, which is situated in the base of the fruit. Plants are set approximately 12 feet apart along the trellis. Towards the spring, or almost any time during the warm weather, providing the fruit has reached maturity, the seed will break into growth. When all danger of frosts is passed planting may be done, and should be as early as possible in order to allow the plant sufficient growing time during the warm weather to establish itself thoroughly for the succeeding season. Later planting is sometimes unavoidable, and although no crop may be harvested the first season the plants will be partly established for the next season.

As long as the seed has started to shoot the fruit is ready for planting, and the usual practice is to place the fruit on its side at an angle of about 45 deg., with the shoot downwards, so that the shoot is about 3 inches to 4 inches below the surface and the narrow end at ground level, or slightly exposed.

Cropping.

Under good growing conditions the plants establish themselves in a short time, and grow rapidly. With the early planting a crop may be harvested during March and April. The following season an early crop will probably set, and will be fit for market during November and December, with the main crop again appearing in March and April.

Plate 12.
Healthy Well-shaped Fruit Ready for Planting.

Fruit may be harvested in between the two crops, but in smaller quantities. It is this condition which makes the choko an ideal plant for the home gardener, as it is very rarely during the greater portion of the year that there are not a few fruit ready for picking. Early crops in some instances are not big, and it is necessary that the plants be plentifully supplied with both food and water when they start into growth to obtain any quantity of fruit at this stage.

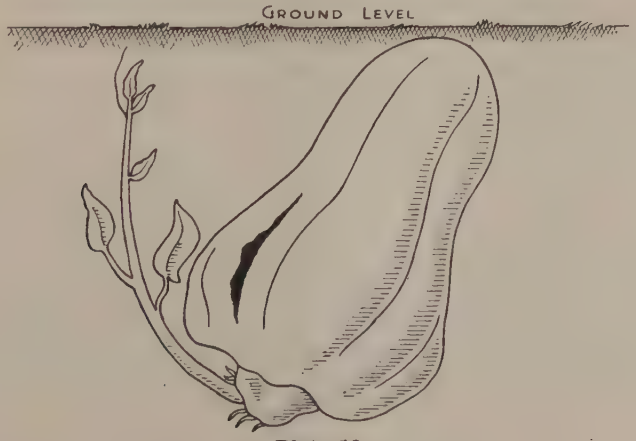


Plate 13.
Showing Method of Planting.

Plate 14.
TWO STRONGLY-CONSTRUCTED BOWERS SUPPORTING HEALTHY VINES.—
Note spread of vines between trellises.

Fertilizing and Manuring.

Although it may appear that this vegetable requires a minimum amount of attention to grow satisfactorily, this is far from true. A successfully grown Choko will produce an abundance of growth and fruit, and in doing so its food requirements are particularly heavy. Farmyard manures appear to be most satisfactory, and *should be applied in the early spring prior to growth*. As the choko grows very rapidly any subsequently applications of manures are made extremely difficult unless spread under the trellis. It is therefore recommended that sufficient supplies of either fertilizer or manure be made in the spring to last the season. The initial dressing may be supplemented by later applications of a top dressing of fertilizer or manure broadcast around the plants *under* the trellis. It is a common practice even with the spring dressings to place a certain amount under the trellis. As a substitute for farmyard manure, meatworks fertilizer may be used, or a complete fertilizer containing a good proportion of meatworks. The fertilizer should be applied similarly to and at the same time as recommended for farmyard manure. Top dressings under the trellis and adjacent to the plants with a quick acting fertilizer high in nitrogen is recommended where the base dressings are of meatworks or meatworks mixtures. One or two top dressings may be done during the season, but one should coincide with the time the main crop is setting during mid-summer.

Eight to ten pounds of fertilizer per plant as a spring dressing when the plants are established should be sufficient with top dressings of 2 to 3 lb. per plant.

Irrigation.

A constant and copious supply of water is essential for good growth, and at no stage must the plants be allowed to lack for moisture. Many

Plate 15.
IRRIGATION LINE LAID OUT UNDER THE VINES.

of the bowers are planned so that a permanent irrigation line is set up under the trellis and is allowed to remain for the season. Thorough soakings are required, and when the plants are in full growth and cover the trellises and the ground in between, the dense foliage tends to lessen evaporation, so that it is not difficult to keep the soil in a moist condition.

Plate 16.
FULLY DEVELOPED MEDIUM-SIZED FRUIT READY FOR MARKET.

Harvesting.

Chokos should be harvested when they are fully developed. They may vary in size according to the type and growing conditions, and should not be allowed to become too old, being picked prior to seed development. They may be marketed loose or packed into clean corn bags, or cases.

Varieties.

There are two varieties—the green and the cream. The former variety is the more popular market type.

CEMENTING LEAKY TANKS.

To cement a leaky tank, iron must first be thoroughly freed of all mud and foreign matter both inside and out. Holes, approximately half an inch in diameter, and spaced 12 inches apart, should then be punched in walls. Wire netting of ½-inch mesh and 22 gauge should next be lapped around tank both inside and outside, layer for bottom overlapping on walls about 6 inches. Both layers should be laced through holes, using fine tie wire. In case of a large tank bottom must be cemented first, overlapping walls about 6 inches, allow to harden so as to provide a foothold when plastering walls. Before plastering tank should be treated with neat cement wash, thrown on surface by means of a brush. This is to provide a bond between tank and plaster.

Then mix a mortar of one part cement to two parts of fine clean sand, with only enough water to form a stiff, but workable, mixture. Apply in thicknesses of half-inch. When hard, score surface to provide a bond for next coat. Allow each coat to harden, then damp cure for two days by covering with wet bags or similar material. Two more coats inside and outside, making a 3-inch wall, are advisable. Thoroughly moisten each coat before applying succeeding one. Finished work should be cured for seven days before filling with water.

If a tank has only a few holes, it may be made watertight by use of cement wash. Before starting fill all holes with rivets, and clean tank thoroughly. Make a fairly thin mixture of one part cement and two parts fine, washed sand. Use a brush to thoroughly splash sides, and before coat is thoroughly dry put on another. Repeat several times until thickness of ¼ to ½ inch has been obtained. For bottom, spread a stiffer mixture of same proportion ½ inch thick, work over with float, and allow whole to dry slowly by protecting with bags.

Almost any receptacle, provided it is substantial, and holes are not too large, can be rendered waterproof by use of following cement wash:—Dissolve one part salt in as little water as possible, and mix into six parts of cement. If necessary, add more water to make mixture take on consistency of thick cream. Holes and seams of vessels to be treated should first be plugged with a less wet mixture of above. The "cream" is then painted over inside and outside of vessel.

A New Zealand farmer advises treating holes from outside with alternate coats of waterproofing paint and cheesecloth as follows:—First apply coat of paint. Then stretch covering of cheese cloth over hole or weak part. Next give another coating of paint. Then a covering of cheesecloth, and finally a covering of waterproofing paint. Where metal around a hole is very thin edges are held in place from inside, while first coats are applied. When various patches have been completed apply coating of the paint to inside of tank.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to the Department of Agriculture and Stock, Brisbane, without delay.

PLANT PROTECTION

Citrus Fruit Rots and Blemishes.

F. W. BLACKFORD, Assistant Research Officer.

FOUR major diseases of citrus were dealt with in the December issue of this Journal, and the attention of growers is now directed to seven other diseases which, while not so important as those already discussed, may nevertheless be a source of quite appreciable loss. The diseases in question are blue mould, brown rot and stem-end rot, sooty mould, smoky blotch or fly speck, oleocellosis or oil spot, rind breakdown, and stylar-end rot of limes; all are responsible for fruit rots or fruit blemishes.

BLUE MOULD.

Known to most citrus growers as blue mould, the two fungous fruit rots, green mould and blue mould, are found wherever citrus is grown. The main difference between the two diseases lies in the colour of the spores of the fungi responsible for the rots, the one producing green spores being the commoner, although very often both may be found together. The two fungi are not active parasites, and both gain entrance to fruit through wounds which may be so small as to be almost invisible; the blue spore disease may, however, also spread from fruit to fruit merely by contact.

The rots are first apparent as a very soft, light-brown, water-soaked area. As this enlarges, a white, cottony mould develops in the centre, and very quickly there is formed a green or blue coating of spores of the fungus, which fly into the air as a cloud when the fruit is touched. In the case of green mould, a fairly wide, well-defined margin of white fungus borders the green area, whereas in the case of blue mould this margin is narrow. The fruit, once infected, decays very rapidly to the final stage, in which it is a mass of soft pulp covered with the green or blue spores.

As the two fungi usually become established in the fruit through wounds, the diseases are most prevalent in wet weather, when the fruit is turgid and easily injured. They are usually encountered in the packing shed and in fruit on the market, but they are quite common in fruit on the tree which has suffered injury by insects, thorns, &c., or has been affected by rind breakdown.

Control.

The most important factor in controlling these rots is the avoidance of injury to the fruit from the time it is harvested until it is marketed; hence the following control recommendations might be summarised in two words—handle carefully. Clippers should be used for harvesting the fruit, a blunt-nose type being the most suitable instrument. With them two cuts should be made, one to remove the fruit from the tree, and the

other to trim the stalk close to the fruit so that no sharp end capable of puncturing other fruit is left. Finger nails should be kept short, and gloves should be worn when handling citrus. Fruit should not be dropped from picking bags into boxes, but transferred to them gently. Picking bags and boxes should be regularly cleaned to free them from sand or soil, and the boxes should be free from rough edges, protruding splinters and nails. The grading plant should have all edges and corners well rounded and padded, and the bins should be cleaned out frequently to remove any stalks, buttons, and grit which may have collected in them.

Once in the packing shed, the fruit should be allowed to sweat before packing, during which process the rind becomes more pliable and less liable to injury than when just picked. At the same time any fruit which has already been injured will almost invariably develop mould and can be discarded. Such decayed fruit should be removed from the packing shed regularly and burned or buried. Fruit, immediately after being picked, may be run through a borax bath, prepared by dissolving 5 to 7 lb. of borax in 10 gallons of water; it is then drained and allowed to dry. However, under Queensland conditions, this treatment will not be necessary to reduce the number of affected fruit, provided the fruit is handled carefully. Wrapping fruit is helpful in cushioning the fruit in the case and in preventing the spread of decay, especially the blue spore type, from an infected fruit to uninfected neighbours.

BROWN ROT AND STEM-END ROT.

Two other fruit rots are occasionally encountered in the wetter citrus districts, and are known respectively as brown rot and stem-end rot. It is very difficult to distinguish between these two diseases, as the appearance of affected fruit is very similar. The rind of diseased fruit in each case develops a dull, light-brown colour, and, when the fungus which causes the trouble penetrates to the pulp, the fruit becomes very squashy. There is no development of spores on the surface of affected fruit, as in the case of blue mould, although, if it is kept very moist in a closed container, a slight growth of cottony fungus may develop.

Brown rot attacks the leaves and twigs as well as the fruit. It is, however, seldom of any serious consequence except in the northern citrus districts. If the disease has been present in previous seasons, cuprous oxide mixture at a strength of 3 in 40 could be applied just before the onset of the rainy season to provide a protective covering for the fruit.

As its name suggests, stem-end rot gains entrance to the fruit through the stem-end. It is caused by the same fungus which produces melanose spots at an earlier stage in the development of the season's crop, and is usually found in orchards severely affected by this disease. If the melanose is checked by the application of the measures recommended for its control, then stem-end rot ceases to be of importance.

SOOTY MOULD.

Sooty mould is not a disease in the generally accepted sense of the term. Its presence on citrus may produce merely a smokiness on the fruit, leaves, or young twigs, or it may be developed sufficiently freely to form a thin, velvety mat of black fungus (Plate 17), which may be

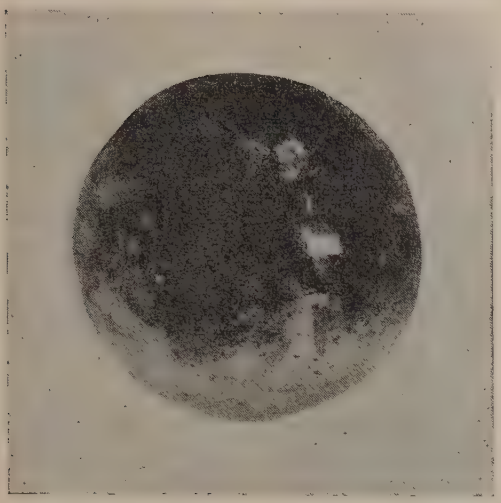


Plate 17.
Orange Showing Development of Sooty Mould.

easily lifted or rubbed off, leaving clean and unaffected tissue underneath. This sooty mould is composed of a number of different fungi, which live on the honey dew or sugary secretions of aphids or certain scale insects infesting the citrus. The fungi do not penetrate the plant tissue at all, which fact explains why no trace is left after the black coating has been removed. The main direct adverse effect produced by the development of sooty mould is the soiling of the fruit and, in heavily-affected trees, the exclusion of sunlight from the leaves.

Control.

When the aphids or the scale insects secreting the honey dew are eliminated, the sooty mould fungi automatically die out and will eventually be removed by the rain and the wind. Appropriate insecticides should therefore be applied to ensure the control of the aphids or the scale insects responsible for the sooty mould development. The mould on affected fruit may be removed by washing it in a mixture of $\frac{1}{4}$ lb. of chloride of lime, i.e., bleaching powder, and $\frac{1}{4}$ lb. of boracic acid in one gallon of water.

SMOKY BLOTCH OR FLY SPECK.

The disease known as smoky blotch may be confused with the skin discolouration caused by the Maori mite or with the early stages in the development of sooty mould. A faint, dull smokiness of the fruit is the first symptom observed in smoky blotch, but, unlike the Maori skin blemish, it can be rubbed off, though not as easily as sooty mould. The discolouration is caused by very fine, dark-coloured fungous threads which grow over the surface of the fruit. Sometimes a number of these threads are tightly woven together to produce extremely-small balls of fungus, and it is from these that the disease derives the very descriptive name of "fly speck." Special measures for the control of smoky blotch are not necessary, as it seldom occurs to any extent, and is usually checked by the application of the routine copper sprays.

OLEOCELLOSIS OR OIL SPOT.

Although all Queensland-grown varieties of citrus may be affected by oleocellosis, or oil spot, this trouble is of most concern to lemon growers because it is on the lemon that symptoms are most conspicuous. Lemons are usually picked according to size and artificially coloured by acetylene; the areas of rind affected with oil spot, which are roughly circular in shape, retain their green colour when the rest of the fruit has turned yellow in the colouring process. In these green areas, which

are very slightly sunken as a result of cell collapse, the oil glands are raised above the surface, a symptom which can be observed before the fruit enters the colouring chamber. In the case of lemons and other citrus allowed to colour on the tree, a drabness of the yellow or orange colour develops in the affected areas with a characteristic collapse of the surface cells of the rind, thus leaving the oil glands raised above the level of the surrounding tissue (Plate 18).

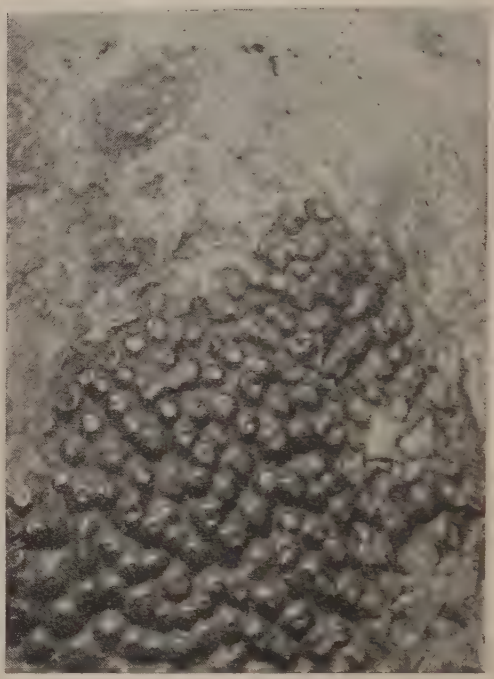


Plate 18.

OLEOCELLOSIS OR OIL SPOT ON CITRON.—Note the raised appearance of the oil glands. (Slightly enlarged.)

The collapse of the cells is due to the liberation, on the surface of the rind, of the natural oil from the oil glands by slight bruising or pressure on the fruit. The trouble is most prevalent on very turgid fruit picked early in the morning when wet with dew or after a rainy spell. Fruit picked later in the day, when it has lost some of its firmness, is less affected. Such fruit has more "give," and the oil glands are less easily ruptured.

Control.

The recommendations made for the control of blue mould are, in general, also applicable to oleocellosis. Fruit should be handled carefully, and picking should not commence very early in the morning if rain has fallen or the trees have been irrigated during the previous twenty-four hours; a similar precaution should be observed during a period of heavy dews.

RIND BREAKDOWN.

Rind breakdown is a trouble which affects lemons, oranges, and mandarins. There is probably no varietal resistance to its incidence, but in Queensland the Emperor of Canton and Scarlet mandarins, the Joppa orange, and the Villa Franca lemon are most commonly affected, possibly because they reach a susceptible stage of development when conditions are conducive to the appearance of the trouble.

On the orange and mandarin it first appears as a flabbiness of the rind, which collapses, wrinkles up, and loses the brightness characteristic of ripe fruit. Partly to fully-coloured fruit is the most susceptible to rind breakdown. Blue mould almost invariably invades the affected part, and the fruit rots and falls.

On lemons the trouble seems to affect only those fruit which are nearing maturity, i.e., fruit just at or prior to the silvering stage. The first recognisable symptom is a slight loss of green colour in parts of the rind, thus producing a pale, mottled appearance. These lighter-coloured parts collapse, forming slightly-depressed, yellowish-brown areas; the oil glands in these areas are brown in colour, while the tissue between these glands is pale, greenish-yellow. The affected parts may cover as much as three-quarters of the rind of the fruit. In a more advanced stage of the trouble, these portions of the rind which surround the affected parts colour prematurely, and a firm, rather brittle, dark-brown scab, often covered by a clear-brown, gummy exudation, is formed on each sunken area. When artificially coloured by the acetylene or ethylene treatment, affected fruit show the blemish of the second stage more clearly as a dull, dirty-brown colour against the clear-yellow of the healthy rind. The pulp is not affected in any way by rind breakdown itself, but certain rot-producing fungi often invade the fruit in the final stages of the trouble; fruit which is only slightly affected, however, keeps quite satisfactorily, though badly discoloured.

This trouble appears after a rainy spell of about three days' duration or after a prolonged period of heavy dews and high humidity, when the fruit remains wet for a considerable time. Apparently in this trouble the rind absorbs an excessive amount of water, more particularly in those parts of the surface which happen to be minutely cracked. In some way this excessive moisture leads to the liberation of oil within the rind, resulting in the death and collapse of the cells surrounding the oil glands. The rind of the Emperor of Canton mandarin is very susceptible to cracking, and accordingly this variety frequently suffers very severely from rind breakdown.

It seems that it is only when fruit have reached a certain stage of development that the trouble is likely to occur. Thus lemons are most commonly affected in March, while June or early July rains cause damage to the mandarins and oranges. Observations have shown that fruit from young and vigorous or heavily-pruned trees develop a coarse type of rind which is immune to the trouble.

Control.

Measures for the control of rind breakdown have not yet been fully investigated, but the following suggestions may prove helpful:—

(1) The fruit should be harvested as quickly as possible after it has matured.

(2) If the trouble has appeared, affected fruit should be carefully culled while packing in order to avoid loss in transit. It is better to hold the fruit a little longer than usual in the packing shed in order to ensure that fruit with a tendency to rot will be discarded.

STYLAR-END ROT OF LIMES.

Although limes are particularly free from disease incidence in Queensland, part of the crop is nearly always affected with stylar-end rot. On affected fruit a small, dry, firm, almost-circular depression, dull greyish-brown in colour, develops in the rind at the base of the "nipple." This sunken patch may enlarge until often a quarter of the surface of

the fruit is affected. Internally there may be a slight breakdown of the flesh, in which small white crystals appear.

Stylar-end rot is not caused by a parasitic organism, but rot-producing fungi may gain entrance to the fruit through the collapsed rind. This trouble manifests itself after a period of hot, dry weather, when the tree is suffering from insufficient moisture. Under such conditions the leaves, transpiring water in excess of the amount being absorbed by the roots, remove some from the fruit, thus producing the typical, basal rind-collapse.

Control.

The incidence of the trouble may be lessened by ensuring that the soil is in an adequately moist condition. The position may be further safeguarded by reducing the amount of nitrogen-rich fertilizers applied to the trees; these tend to produce heavy leaf growth, thus increasing transpiration of water at critical periods. Picking the fruit as early as possible helps to avoid the trouble.

COMMON WILD POISONOUS PLANTS.

Common wild poisonous plants in South-Eastern Queensland include:—

Moreton Bay Chestnut (*Castanospermum australe*), a large tree common in scrubs or rain forests and along creek banks. The pods bear one to several large chestnut-like seeds. In the raw state, these seeds cause severe gastro-enteritis, but the poisonous principle was removed by washing and cooking by the aborigines, who used them as food.

White Cedar (*Melia dubia*), a common tree, especially as secondary growth in paddocks. It is also frequently planted as an ornamental tree. The leaves are finely divided, and the flowers, pale lavender in colour, are borne in large trusses. The berries are poisonous. They are oval and about the size of a small pigeon's egg.

Native Bryony (*Bryonia laciniosa*).—This plant is very common along scrub edges and in newly-felled scrub areas. It is a vine, and the fruits, which are poisonous, are at first green with white wavy stripes, later bright red with the same white wavy stripes.

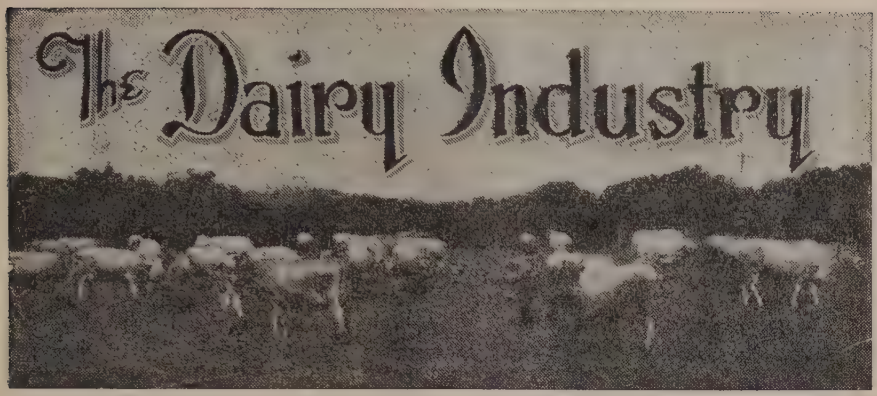
Thorn Apple or Stramonium (*Datura stramonium*) is a common weed of cultivation. It has rather a rank nauseous smell. The flowers are white or (in one variety) purple, and the seed pod is very prickly.

Green Cestrum (*Cestrum Parqui*).—This plant is very common in vacant allotments about the larger towns, especially about Brisbane, and has caused losses among dairy cows. The leaves and the berries, if chewed, are likely to cause death. It suckers freely from the roots, has greenish-yellow or rather brownish flowers followed by little black berries.

Poisonous Corkwood (*Duboisia myoporoides*) is fairly common, especially as secondary growth in many paddocks in South-Eastern Queensland. The wood is light, the bark corky, the leaves usually are a pale-green, flowers white, and small berries black.

Castor Oil (*Ricinus communis*) is quite common as a weed in vacant allotments about the larger towns, also along creek banks in many bush localities. The mottled seeds are poisonous, and though the source of true castor oil, they contain a poisonous principle.

Milky Mangrove (*Excaecaria Agallocha*) is a fig-like tree common in mangrove formations. The milky sap if it gets into the eyes causes temporary blindness and intense pain. Children in Queensland sometimes use the sap of the Moreton Bay fig and other figs as a chewing gum. They have used the sap of Milky Mangrove in mistake once or twice with fatal results.



Good and Bad Practice in Milking.

L. VERNEY, Dairy Instructor.

MEASURED in terms of people employed, capital invested, and value received, dairying is one of our greatest land industries. There is no substitute for milk; for young and old alike it is the perfect food, containing all the elements required in order to sustain life. These facts alone make it obvious to every producer that the rules of strict cleanliness should be observed in milk production.

The principal factors which determine the quality of milk are its food value, cleanliness, and keeping properties, all of which are within the scope of the daily practice of any dairyman.

Those whose duties bring them in close association with the daily routine of dairy farms have exceptional opportunities for observing various methods of milking and also the attitude of the milker towards his cows.

Women, generally, are better milkers than men, because, probably, of their gentler nature. Many milkers apparently ignore the fact that in the process of milking a cow, good judgment, skill, and, above all, a kindly attitude are needed if the best results are expected. The cow, more especially the high-producing animal, is "a bundle of nerves" and her balance is very easily upset.

Cleanliness Essential.

Milk cleanliness is not always appreciated by some producers. While dirt may not necessarily impair the healthfulness of milk, it does impair its keeping quality because of the bacteria introduced with it. It is common knowledge that most of the dirt found in milk is introduced at the time of milking, yet how many dairymen brush their cows to remove any loose hairs and dirt which may float into the bucket? This brushing or grooming should not be regarded as just another job to be dodged, but as an essential in the daily routine of dairy practice.

The washing of the flanks, udders, and tails before milking is neglected too often. After all, it takes up very little of the milker's time and one is amply repaid for the little extra work involved.

"Wet" Milking Condemned.

A general practice is the wetting of the hands with milk, and it is one that is strongly condemned as a filthy habit. "Wet" milking is a very prolific cause of high bacterial count in milk samples taken for the determination of keeping quality and purity. Some dairy farmers excuse the practice of "wet" milking by stating that the calf is a wet milker; the calf is a wet milker from the fact that it has no other choice of systems, and it is well for those having that idea to keep in mind the fact that the calf is not producing milk for human consumption. Any dairyman who changes his system of milking from "wet" to "dry" will have no cause to worry about a high bacterial count.

Milking Should be Efficient, not Perfunctory.

On some dairy farms, milking is done rather perfunctorily, and quality suffers in consequence. After the milk has been drawn, unless it is carefully strained, the results may nullify any precaution taken at the time of milking. Some use defective strainers and many none at all. Proper straining will remove all the visible dirt, but no strainer is fine enough to hold back the bacteria. The idea that straining will remove any defect in the milk due to carelessness at the time of milking is quite unsound.

Danger lurks not in the visible dirt but in the invisible dirt. It should be borne in mind that any strainer will become a serious source of contamination if it is not kept sterilized.

As odours are most readily absorbed during the time of milking, smoking should not be permitted on the dairy premises during milking operations. The clothes worn by those taking part in the work of dairying should be clean and not milk-grimed or greased. In any case, the wearing of dirty clothing while milking is quite inexcusable.

In all branches of milk production, let the slogan be—

A clean milker with clean hands, clean cows, and clean dairy utensils.

DAIRY CATTLE BREEDING.

A dairy farmer may not hope for great success unless his herd has a foundation of good blood. The widespread use of inferior sires has been for years the primary cause of low production figures per cow, and of needlessly poor quality. Obviously the continuance of such conditions is both uneconomic and unnecessary, and the most direct and practical means of herd improvement is to use sires of true representative type of a particular breed, and which are backed up by yearly records of their ancestors.

Breeding establishes no new traits or characteristics. It simply selects and concentrates them. Good breeding eliminates the low producing characteristics of an animal.

Animal breeding is an art as well as a science, and not every breeder of pure-bred cattle is a genius at it. In other words, to be successful, a breeder should possess certain natural gifts, and, above all, he should be a student and a very alert one at that. It is only in comparatively recent times that we have begun to acquire accurate knowledge of the operation of some of the laws that govern the breeding of animals. It was through the patient, untiring work of an Austrian monk, Abbot Mendel, who laid down the law of definite breeding in plants, that we to-day are able to work on similar lines in cattle breeding. Since Mendel's day the science of genetics has made very rapid progress, and evidence of the true behaviour of animal characters is beginning to accumulate. It is a fundamental rule in breeding dairy cattle that "like begets like," but in the union of opposites we get "throw backs."

The dairy cow of to-day is largely an "artificial" product. She has attained her high production capacity through scientific feeding and breeding. We live in an age of specialisation, and, if dairymen would specialise more along the lines of breeding and feeding far better results would be obtained.

—L. VERNEY.

Reasons for Keeping Milk Records.

L. VERNEY, Dairy Instructor.

FOLLOWING are some convincing reasons, universal in their application, for keeping records of dairy cows and which are of first importance to everyone who milk cows for a living.

(1) Milking records constitute a guide for the feeding of each cow according to the quantity of milk she produces. Records stimulate better feeding and breeding. The dairy farmer who keeps records usually feeds a balanced ration and becomes interested in winter feeding, and so maintaining his milk supply throughout the year.

(2) The weighing of the feed and milk keeps the dairyman in close touch with the daily condition of each cow; ill-health is thus readily observed.

(3) Milking records form the only basis on which a herd can be improved.

(4) No careful dairy farmer will buy a bull for use in his herd whose dam has not an authentic record, showing creditable milk and butter-fat production.

(5) Records alone will sell cows when no other quality will. Grade cows with records can be sold from 25 to 50 per cent. more than those for which there are no milking records.

(6) A system of records is the first step in building up a herd. Unprofitable cows are the most expensive; their heifer calves are usually low producers and should not be kept for the milking herd.

(7) Records also stimulate better milking. Milk scales serve as a check on the milker and induce him to milk more thoroughly than when the milk is not weighed. A knowledge of what each individual cow is doing develops personal pride and interest in the herd.

(8) Finally, records make dairying a business proposition and, in various incidental ways, mean more money to anyone who milks cows for a living. A maxim which should be prominently displayed in every milking shed is—

The cow, not the herd, is the unit of profit.

Herd Testing and Culling.

C. R. TUMMON, Dairy Inspector, Malanda.

HERD testing, if done thoroughly and systematically, is one of the best means of ascertaining which are the highest producing cows in the herd, thus indicating to the farmer the cows which should be retained and the cows which should be culled. A good bull, with a background of high production, should head every herd.

A short period of herd testing is of no value whatever. To get the maximum results, testing should be continued over a term of years. Culling should not necessarily be associated with the testing. The extent to which culling out the lowest producers of butterfat should be practised depends largely, of course, on the size of the herd, and also on the extent to which the farmer can afford to dispose of his

cows. However, where culling can be practised extensively after the first year's testing, the quickest possible results will be attained. The farmer should endeavour to set his own standard for butterfat production per cow, and any cows failing to reach this standard by the end of the lactation period should be fattened immediately for the butcher. Culled cows should never be sold to another farmer for dairying; otherwise the ultimate object of herd testing—the raising of the average production per cow for the whole State—will be defeated.

Farmers may either test their own herds, or avail themselves of the free herd testing service provided by the Department of Agriculture and Stock. If a farmer decides to do his own testing, full details of the Babcock test, together with information covering the estimation of butterfat for the lactation period, are obtainable free of charge from the Department.

However, with the free herd testing service, very little effort is required of the farmer. Milk sample bottles containing preservative, together with instructions for sampling, are sent to the farmer about a week before the test is due. The freight both ways on the bottles is borne by the Department. The farmer has to record the names of his cows on the chart provided, together with date of calving. He then has to weigh the amount of milk received from each cow during a forty-eight-hour period, record the weight opposite each cow's name, and take a composite sample of each cow's milk, which is placed in the bottles, numbered correspondingly and returned to the departmental officer for testing.

No fewer than five tests should be made during the 273 days lactation period, in order to gain a reasonably accurate estimate of the butterfat produced during that period.

In very many cases, the lowest producing animals are the most intractable to handle, the most difficult to milk, and consume the most feed; so it is obviously to the farmer's advantage to be able to rid the herd of the culls from the point of view of less work with greater efficiency and consequent economy in feeding.

The saving in time alone, because of having to milk fewer cows for the same return, is a substantial factor in successful dairying.

MEASURING FOODSTUFFS.

Measuring foodstuffs by handfuls is wasteful and unsatisfactory. Use this table:—

1 bushel = 8 gallons = 32 quarts.
1 kerosene tin (4 gallons) = half a bushel.
A box 4 in. by 4 in. by 4 in. = 1 quart.
A box 6 in. by 6 in. by 8 in. = 1 gallon.
A box 12 in. by 12 in. by 15½ in. = 1 bushel.

(Inside measurements are followed.)

A quart tin filled, but not packed, would represent one thirty-second part of a bushel and would work out as follows:—

	Lb.	oz.		Lb.	oz.
Wheat	1	14	Peas	1	14
Maize	1	12	Barley	1	6
Oats	1	4	Salt (common)	2	0
Bran	0	10	Pollard	0	10
Wheat Meal	1	8	Meat Meal	1	8

Selection of Breeding Stock.

E. J. SHELTON.

THE purpose behind selection of good breeding stock, provision of good accommodation, and correct management is to increase numbers and reduce costs of production. The greatest losses occur between the farrowing and the weaning of a litter, hence the necessity for paying due attention to all sows with litters. Careful management will control most losses by removing the causes as far as possible before farrowing.

Now, more than ever, economy of production is essential, not only to the individual but to the nation generally.

In selecting breeding stock the first rule to observe is to make sure that the animals come from a dependable herd of clean, healthy stock. To be classed as clean and healthy, the herd should have been submitted to the agglutination test for porcine abortion with negative results and it should have a clean after-slaughter record. Similarly, freedom from other infectious and contagious diseases besides brucellosis and tuberculosis is important; and it is just as necessary that the young pigs, in particular, are free from intestinal worms, kidney worms, and other internal parasites, and also external parasites.

It is unwise to proceed with selection of the foundation stock until an ample supply of food is assured and until provision has been made for conservation of fodder in the form of grain and root crops for grazing and for a supply of both carbohydrate and protein-rich bulk foods or concentrates (meat meal, linseed meal, and other substances). Before the stock arrive, ample provision should have been made for their accommodation on the farm, for once purchased they become the absolute property of the purchaser and vendors usually expect to be relieved of responsibility as soon as the deal has been completed.

Prior thought should also have been given, of course, to the class of pig it is desired to produce; present day demand is for medium to heavyweight baconers in preference to all other classes as being suitable for bacon or canning. These heavyweight animals have to be in the fleshiest of condition when sold or consigned, for there is no really dependable market for pigs carrying too much fat. Admittedly, wartime shortages of meat may seem to suggest that any old pig is good enough to realise top prices, while at auction sales it may seem to be that the fatter the pig the better the price. These are, however, only passing phases of the pig industry, and it would be unwise to depend on the overfat pig realising top prices as a regular happening.

What a Pig Should Be.

In the breeding of pigs it was at one time decreed wise procedure where the sows were of a long, rangy type to select a boar of short, compact stature so that there would be, as was then believed, a good admixture of types in the finished product. That advice is not now applicable, for the constant demand is for more and more lean meat with a minimum of firm, white fat, well intermingled (called marbling) through the lean tissues. In consequence, both boar and sow should be strictly of bacon type, lengthy, fleshy, with light forequarters and head, well developed back and loin, with compact, full, fleshy hindquarters.

Fortunately, these long, lean-type animals are usually more prepotent and prolific than short, squat types; and they have the advantage that they grow rapidly and mature at an early age. Both male and female should have a sound constitution, be strongly built, have strong, straight legs, and they should carry themselves in a way that indicates vigour and healthy development—the male being definitely masculine the female relatively feminine, docile, and evenly tempered.

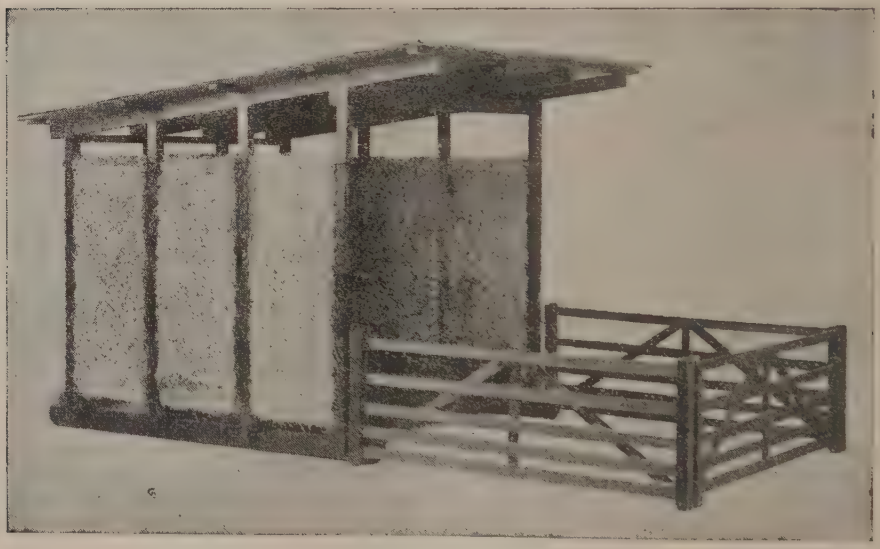


Plate 19.

COMFORTABLE PIG ACCOMMODATION ON THE FARM.—It is useless buying good quality breeding stock unless provision is made for comfortable and healthy quarters on the farm.

Age to Mate.

Boar and sow should not be allowed to mate until they are well grown, usually after they are nine months of age. There is no reason why, if well cared for, these animals should not prove satisfactory breeders up to the age of six or even seven years, but there should be a very strict system of culling any animal immediately unless they come up to the desired standard. There is no shortage of good quality young breeding stock and prices invaribaly are most reasonable, although higher now than when bacon pigs were worth only around 4d. to 5d. per lb. dressed weight.

Transport of Breeders.

The transport by rail of pedigreed and other pigs for breeding purposes is arranged most conveniently by placing the animals in properly constructed crates and sending them by express goods or other trains giving rapid transport to their destination.

Sales of breeding stock are usually arranged on the basis of delivery in crate at sender's station and subject to return of crate to the same station, freight paid (if any), by purchaser and as early as convenient after delivery. Forward freight on such consignments in Queensland is subject to a rail rebate of 20 per cent. (on pedigreed as well as non-pedigreed animals), an amount which should be deducted from the freight total when it is being paid either by consignor or consignee. This rebate, however, is subject to the railway waybill being endorsed: "For breeding purposes."

Plate 20.

A Suitable Type of Crate for Transport of Stud Pigs.—Note that although this crate has been used principally for weighing pigs on the farm, it is of a type adapted for both purposes, the wires being attached when crate is used for weighing.

Care should be taken always to see that the crates are sufficiently large to allow the pigs reasonable freedom of movement, that a trough for food and water is provided, and that movable doors are fitted at each end.

It is usually better to use sieved sawdust as bedding in pig crates instead of straw or grass. If pigs are consigned by rail for more than about 300 miles, arrangements should be made for an agent to feed and water the animals en route; the expense incurred should be part of the original quotation or a condition of the transaction.

Wherever possible, the despatch of stud pigs in crates should be so arranged that the animals will not have to travel during very hot weather, especially over long distances. It should be specially noted, too, that consignments of stud pigs in crates will *not* be accepted for transport by passenger or mail trains.

In all such transactions three parties are principally concerned—the consignor (that is, the sender or vendor), the consignee (the person receiving), and the Railway Department or other transport authorities.

So far as the Railway Department is concerned, provision is made covering the transport of the live animals at scheduled rates, but there are no special regulations relating to the carriage of returned empty pig crates, although they are given the same attention as other classes of goods.

The consignor is the one principally inconvenienced where there is delay in returning empty pig crates, for it is not usual for stud pig breeders to carry a stock of crates, only those actually required being available.

The Railway Department, of course, also becomes involved where there is delay in return of empty crates. In a recent report the Secretary to the Commissioner for Railways, Brisbane, had this to say, *inter alia*, in discussing the condition of crates as received and some of the hindrances to rapid return:—

> *Crates.*—No doubt these are made as light as possible to minimise freight; consequently, after a period in use they become insecure and liable to damage by the pigs. The boards so often reported as missing are probably removed by the person receiving the pig to release the animal from crate and are not replaced on the crates when being returned.
>
> *Delay in Transit.*—Consignees (unfortunately) invariably use the original consignor's label as a return address, after alteration, and the labels falling off thus lead to the crate being separated from the book entry and resulting in its being held (by the railways) until placed through official correspondence.

As an illustration, the Secretary to the Commissioner indicated that the General Manager at Rockhampton had occasion to report to the General Manager at Brisbane that three pig crates addressed to a well-known stud piggery on the main line had been lying on the platform at an isolated siding for a considerable time. These crates had apparently been dumped on the platform without the farmer taking the trouble to consign them—that is, making out a consignment note and informing the station-master accordingly.

The farmer apparently was under the impression that empty pig crates are dealt with in the same way as empty cream cans; but this is not so, because crates must be consigned as goods, and unless so consigned their return may be unduly delayed.

Stud pig breeders and others concerned should note, therefore, that before empty pig crates are accepted by the railway authorities for return to the original sender's station they must be consigned in the ordinary way, and where freight is payable—as it is in the case of crates carried over long distances—freight must be prepaid by the

person consigning, or finally by the person receiving the crate, if sender's station is not one at which there is an officer in attendance.

It is a good practice to advise the consignee by letter when empty crates are being returned so that he shall not have to make unnecessary visits to the station in search of the crates.

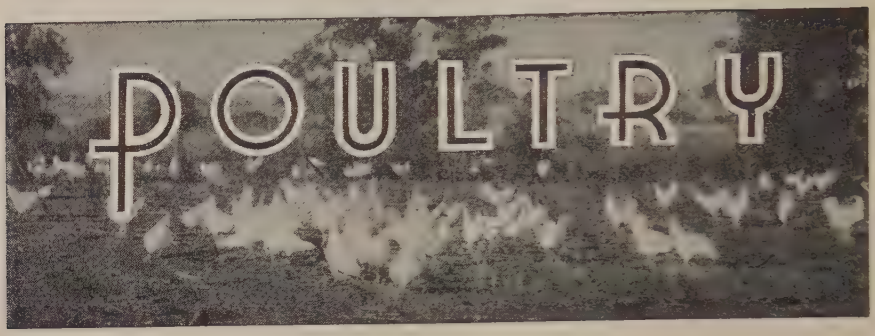
The Railway Department cannot, obviously, be held responsible if senders neglect to consign, or consign crates with boards missing or otherwise damaged, or without correct address labels firmly affixed to the crate.

It is wise to book space beforehand where crates are being forwarded, either with the live pigs on the forward journey or when empty crates are being returned.

Particulars regarding the size of crates, materials used, and any other information on the subject may be obtained from the Department of Agriculture and Stock, Brisbane.

Plate 21.

The Paddock or Grazing System Permits of the Economical Use of Areas Suitable for Grass and Fodder Crops.—The paddock system also calls for less labour.



Care of the Laying Hen.

P. RUMBALL.

AS the chief source of profit on the ordinary commercial poultry farm, pullets require very careful management. They are easily upset, and even a slight alteration in procedure may stop them from laying. Therefore, any proposed change in feeding or management should be made before the birds commence to lay.

Pullets should be so fed as to ensure their continuous growth. If given dry mash they should have ample feeding room—one foot of feeding space to ten birds is recommended. Plenty of mash should be always available to them. Any shortage will retard growth, or, if they are laying, cause a cessation of egg production. Should the wet mash feeding system be adopted, it is advisable to give one full meal of mash early in the morning, followed by a smaller meal at midday. These meals should be fed at about the same hour every day.

In feeding grown birds, the general practice is to supply only the morning meal of mash; and, if it is desired to adopt this practice for the pullets when they are full-grown, it is essential that the mid-day meal of mash be discontinued before they commence laying. Chaffed green-feed or soaked lucerne chaff could be fed at midday to replace the meal of mash.

Growing mash is usually fed until the pullets are about four months old, and then a change made to laying mash. Making a change at this age has the advantage of not affecting the birds. Should the change be left until the pullets have commenced laying, it is essential that the process be gradual, and at least one week taken to complete the process.

As a general rule, the evening meal should consist of grain—wheat or maize, or a mixture of both. If it is desired to make a change in the grain ration, this should be done prior to the start of production; or, if later, this change should also be a gradual process.

Pullets being reared in colony houses or temporary quarters should be moved to the permanent houses before they commence laying. Should this be delayed until after they have commenced laying, there would probably be a general "strike." The number in each unit is an important factor. Pullets will make more uniform growth and production will be highest when kept in relatively small groups. Groups of more than 100 are undesirable.

In no circumstances should pullets be overcrowded. One of the most common faults in poultry management is that a large number of pullets are reared without making the necessary provision for their accommodation.

Most poultry-raisers have a general knowledge of the principles and practice of feeding, and take into consideration factors that make for efficient and economic production.

Present-day values of cereals may induce some to depart from old and accepted practices in order to reduce costs. There are three points, however, that should not be lost sight of if the best results are to be obtained and the general health of the stock maintained—viz., the vitamin content of the ration, the protein content, and the quantity supplied.

Vitamins.—Vitamin A is of outstanding importance at the present time, for a shortage in the ration may cause outbreaks of nutritional roup as well as lowered egg production. The feeding of yellow maize and green feed ensures a sufficient supply of this vitamin. The price of maize will, however, preclude its inclusion in the ration to the same extent as in past years. Wheat will be used to replace this cereal, and so one source of vitamin A is lost.

On most poultry farms during the winter months green feed is not plentiful; consequently, in normal circumstances the loss due to a shortage of maize cannot be overcome. It is, therefore, of paramount importance that the poultry-raiser should make a special effort to supply the birds with good, succulent green feed. Green feed is the cheapest form in which the birds' requirements of this vitamin can be supplied. In cases where home-grown feed cannot be obtained, poultry-raisers should use at least 10 per cent. of good green lucerne chaff or meal in the mash fed to their birds.

Protein.—To obtain the maximum economic production, laying birds should have in their ration (i.e., grain and mash) a total of approximately 15 per cent. of crude protein. Maize has about 10 per cent. and wheat about 13 per cent. of protein. Where maize has been used extensively and is replaced with wheat, it may be desirable to reduce slightly the protein content of the ration. This is most easily brought about by a slight reduction in the meat meal fed.

Skim Milk a Protein Rich Food.—Skim milk is an excellent poultry food, and if fowls are given all the skim milk they can drink, and even if fed on nothing else but grain, they will continue to lay well.

Farmers generally appreciate the necessity of efficient feeding, and to give their fowls the necessary amount of protein use one or other of the prepared mashes. These mashes are usually fed with grain, the birds being given an equal quantity of each. In these circumstances, a sufficient amount of protein is made available to the birds.

The farmer who has skim milk to give his birds may, therefore, depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of skim milk available. If the birds are given only, say, half the skim milk they will consume, half the quantity of mash that is usually fed should be supplied, and the grain increased by about 50 per cent.

It will generally be found a sound policy when milk, mash, and grain are being fed to the flock, to give the birds all the grain that they will consume, and not force them to eat given quantities of mash. This policy will largely enable the birds to balance their own ration.

Quantity.—Providing the right kind of food is being used, economic production is only possible by feeding the birds all they will consume. Do not be afraid of making your birds unduly fat. The good producer will convert the food supplied in excess of body requirements into eggs. Birds which cannot do this should be culled and sold for table purposes.

Water.—Irregular supplies of water will retard growth or affect production to a greater degree than any other factor. Therefore, a strict watch should be kept to see that the pullets have a constant supply of clean, fresh water, and that it is situated in a cool, shaded place.

MARKETING TABLE POULTRY.

To obtain the highest returns, it is obviously necessary to market poultry for table purposes in the best possible condition. The term condition may be taken to mean the state of the feather, flesh, and age of the bird. If culling of the layers receives the attention that it should, little can be done by the poultry raiser to improve the returns that he will receive from cullled hens.

Experiments have indicated that the flesh carried by a well-fed hen at the end of her period of egg production cannot be increased economically by a system of feeding, and that the hen that has lost weight because of regular egg production takes too long to respond to a course of feeding. The best practice, therefore, is to market culled hens before they become a mass of pin feathers. This condition applies particularly at this time of the year.

Just now, the correct marketing of cockerels is of particular importance. This class of fowl sells reasonably well at any stage of development, if the bird is sold before it reaches what is known as the "staggy" stage. This term is applied to birds commencing to show spur development. In order to obtain the maximum value for cockerels for table purposes, they must be sold while the spur is still in the bud stage. Many breeders keep cockerels until this stage has passed, and, consequently, do not get top prices.

In the marketing of cockerels, it is well to examine the feather growth. Cockerels with a lot of pin feathers do not dress attractively. This applies particularly to birds such as the Australorp, because of the colour of the plumage. Pin feathers on white feathered birds are not so noticeable.

Again, certain breeds are not well-fleshed at all times. This applies generally to the bigger birds—such as the Light Sussex and the Rhode Island Red.

To summarise—poultry raisers with cockerels to market should, firstly, bear in mind the fact that birds with indications of spur development do not realise the maximum value; secondly, that the rate of development of cockerels from twenty to twenty-four weeks of age is not as great as that which takes place earlier; consequently any increase in body weight is at a greater cost; and thirdly, that it is undesirable to market cockerels carrying a lot of pin feathers, and those that are scraggy and not well fleshed.

Wool Classing—A Comparison.

J. L. HODGE, Instructor in Sheep and Wool.

SUBJOINED is the estimated wool clip from 10,000 merino sheep, classed properly. Although the prices shown are rather lower than present-day appraisements, they may be regarded as a fair approximation. For purposes of this estimate, sexes of the sheep have been ignored and lambs excluded, and its object is to provide a comparison of market values in respect of a well-classed clip and a clip classed less carefully.

In interpreting these tables, it should be remembered that the fleeces are free, that the clip is a good one and would average over the price obtained per lb. for the whole appraisement. It totals 250 bales, made up of 166⅔ fleece wool, 25 broken, 24⅓ pieces, 10 bellies, 12 stains, and 12 locks—classed as follows:—

Class.	Number of Bales.	Price per lb.	Nearest £. Value per Bale.	Total.
		d.	£ *s.* *d.*	£ *s.* *d.*
AAA W (or E)	31	14½	18 2 6	561 17 6
AA W (or E)	46⅔	13	16 5 0	758 6 8
A W (or E)	29	11½	14 7 6	414 17 6
AAA Combing W (or E)	33	13½	16 12 6	548 2 6
AA Combing W (or E)	27	12	15 0 0	405 0 0
Broken W (or E)	25	12½	15 12 6	380 12 6
Pieces W (or E)	24⅓	10½	13 2 6	319 8 4
Bellies W (or E)	10	9	11 5 0	112 10 0
Stains W (or E)	12	6	7 10 0	90 0 0
Locks W (or E)	12	3½	4 7 6	52 10 0
	250	..	..	£3,643 5 0

Estimate of a clip from 10,000 sheep (merino) classed indifferently at approximately present-day prices.

Class.	Number of Bales.	Price per lb.	Value per Bale.	Total.
		d.	£ *s.* *d.*	£ *s.* *d.*
AAA W (or E)	64	13½	16 12 6	1,064 0 0
AA W (or E)	73⅔	12	15 0 0	1,100 0 0
A W (or E)	34	10½	13 2 6	446 5 0
Broken W (or E)	20	11	13 15 0	275 0 0
Pieces W (or E)	20	9½	11 17 6	237 10 0
Bellies W (or E)	11	7	8 15 0	96 5 0
Stains W (or E)	13⅓	6	7 10 0	100 0 0
Locks W (or E)	14	3½	4 7 6	61 5 0
	250	..	..	£3,380 5 0

Note.—AAA combing W (or E) and AA combing W (or E) is strong wool which in the first place was taken out as shown. Here it is left in AAA W and AA W (or E), thereby depreciating the prices to the levels they brought when taken out.

A W badly skirted therefore goes up 5 bales in number, but loses 1d. per lb.

Broken has been picked badly and loses both in number of bales and price per lb.

Pieces treated carelessly, some wool going to stains to the loss of pieces, but no gain to stains.

Bellies unskirted or done badly, lose 1d. per lb.

Stains gain at the expense of pieces (a more valuable wool) in weight, but not in price.

Locks become heavier as the result of carelessness and want of supervision on the part of the classer, but the price received is no greater, thus losing the difference between stain prices and locks for every pound gained in weight.

——	Bales.	Lb.	Value.	Difference.
			£ s. d.	£ s. d.
Clip—well classed	250	75,000	3,643 5 0	263 0 0
Clip—classed indifferently ..	250	75,000	3,380 5 0	..

Price per lb. No. 1 clip, 11·6d.

Price per lb. No. 2 clip, 10·8d.

I have thought it well for purposes of illustration to take a well-classed clip as against one classed with less care.

The figures work out well for the purpose for which they are intended. For instance, it would be quite easy to reduce the amounts obtained for clip No. 2 to almost any figure in reason, but here I have shown distinctly the loss entailed in a clip classed, but done indifferently, in comparison with the same clip handled properly.

I might mention that I have been more than fair in the figures quoted to the indifferently classed clip.

FENCING POSTS.

Distance Apart.	Number of Posts.	
	Per Chain.	Per Mile.
6 feet	11·0	880
8 feet	8·25	660
9 feet	7·34	587
10 feet	6·6	528
12 feet	5·5	440
14 feet	4·7125	377
15 feet	4·4	352
16 feet	4·125	330
18 feet	3·675	293
20 feet	3·3	264
33 feet	2·0	160

ANIMAL HEALTH

The Supplementary Feeding of Sheep in the Central West.

G. R. MOULE.

IN many parts of the Central West it has become the practice to feed mineral supplements to sheep when they are forced to graze on dry coarse feed of low nutritive value.

As proprietary lines are not available, the following article has been prepared for the guidance of graziers who desire to feed supplements.

The Necessity for Supplementary Feeding.

As the Central West is situated in our summer rainfall area, the normal seasonal expectancy is a flush of feed during the warmer months. If the winter is wet the "herbage" plants carry the sheep along until the spring storms and the wool grower feels justified in stating he has had a good season.

Winter rains only occur, however, on the average, one year in every five. In very cold winters, and particularly if a few ineffective showers of rain fall, the pasture quickly deteriorates in quality, and the sheep soon show the effects. Although general drought conditions do not exist, the sheep experience a temporary "protein drought," and accordingly, if supplementary feeding is to be undertaken, it should aim at overcoming this protein deficiency.

Observations made on young sheep on both "Downs" and "Desert" country have indicated that under the present dry conditions sheep may suffer a calcium shortage, and this is further borne out by the analysis of dry Mitchell grass.

Calcium is necessary for young sheep in developing good bones and teeth. It is an important constituent of milk, and consequently supplies of calcium should be included in any supplement fed to lambing ewes or young sheep.

Is Salt Necessary?

Salt is helpful in a supplement for controlling the amount of supplement eaten. It is also useful in starting the sheep on the supplement. There is no conclusive proof that a supplement of salt alone is helpful or necessary to sheep, especially those on saline bore water, and as it is in short supply it has been curtailed severely for feeding to sheep.

A Suitable Supplementary.

A supplement that will assist sheep on dry feed can be made by mixing the following ingredients:—

Salt—30 parts (by weight).
Ground limestone—35 parts.
Protein rich meal (meat meal, cotton seed meal, linseed meal, &c.)—35 parts.

The whole can be bound with well diluted molasses and allow 1 oz. per head per day for young sheep and 2 oz. per head per day for lambing ewes, or a little over ¾ ton and 1½ tons respectively per thousand per month.

Control of the amount sheep eat is often difficult. Probably the best way is to incorporate about 10 per cent. of gidyea ashes (rich in lime) in the supplement. As the sheep get more accustomed to the supplement it may be possible to reduce the amount of salt and increase the amount of ashes.

Is Supplementary Feeding Worth While?

This is a question graziers must answer for themselves. The above supplement will cost a little over £10 per ton to make up, and 3 tons would last 2,000 sheep about 2 months at 1 oz. per head per day. This, of course, is cheap agistment, but when larger flocks have to be handled the labour of mixing and distributing the supplements becomes quite a factor to consider.

On the other hand, rainfall figures show that about 60 per cent. of all Augusts, Septembers, and Octobers are well below average for most places in the Central West, and accordingly if graziers decide it is necessary to feed a supplement they should be prepared to do so for a period of probably two or three months.

Fluorine Poisoning of Live Stock.

G. R. MOULE.

RECENT surveys have indicated that the element fluorine, which can be poisonous to live stock, is causing a considerable amount of trouble amongst sheep in certain parts of Queensland. Therefore, this short note on fluorine poisoning of live stock has been written for the information of stock owners.

Fluorine has been detected in certain artesian and sub-artesian waters in the Central-Western district. Sheep, cattle, or horses drinking this water may show symptoms of fluorine poisoning.

The Effect of Fluorine on the Animal Body.

The toxic effects of the element can be recognised easily. Actually it is found that fluorine is strongly attracted to the calcium (lime) in the bones and the teeth, and these organs are most commonly affected when poisoning occurs.

The bones lose their normal colour and "sheen" and become thickened and softened, and they break easily. Sometimes bony outgrowths, usually referred to as exostoses, can be detected on the surface of the long or flat bones, e.g., the bones of the leg or the lower jaw.

If the animal becomes affected during the growing stage of the teeth, a peculiar mottling of the enamel occurs. Naturally this can be observed most readily on the incisor (front teeth) of animals. If the molars (grinding teeth) are examined they will be found to be worn very unevenly. The careful observer will also notice that the permanent teeth do not come through at quite the right time.

If older mature animals are subjected to a large daily fluorine intake they usually waste away and eventually die, and there is very little that can be seen on post mortem.

Quantity of Fluorine Required to Poison Animals.

When the fluorine occurs in the water and the animals are subjected to a constant fluorine intake, very small quantities are required to set up poisoning. Cases have been recorded from Western Queensland where sheep have been poisoned on water containing 12 parts of fluorine per million. Actually there is evidence to show that regular intake of waters containing as low as 1 part/million can be harmful.

There are indications to suggest that the period of time over which the fluorine is consumed is of as great importance as the dose, that is to say, fluorine is a slow cumulative poison.

Animals Affected.

Sheep are the animals that seem to be most commonly affected in Queensland, probably because the fluorine waters occur mostly in the sheep country. However, cattle and horses drinking this water can also be affected.

Symptoms.

The main symptoms produced are:—

(i.) Emaciation and decreased appetite.
(ii.) Salt hunger.
(iii.) Stiffness of the joints.
(iv.) Abnormal teeth and bones.

The emaciation and decreased appetite are probably secondary to the abnormal teeth, which obviously cannot grind foodstuffs properly.

Treatment.

No curative treatment is known to be of value. If the animals are removed from the supply of fluorine, some degree of recovery results, though the damage to the teeth is permanent.

Prevention.

It is advisable to have water from bores and sub-bores analysed for fluorine content, and any poisonous waters can then be avoided.

It is important to note that intermittent fluorosis is not too harmful, and this gives owners of fluorised waters a chance of managing their properties more or less successfully by arranging switches at regular intervals from surface to bore water or from bore waters, proved by analysis to contain fluorine to bore waters proved to be safe.

FLIES IN EYES.

There are various ways of relieving a horse suffering with "fly strike." One is pennyroyal and olive oil in the proportion of 1 oz. to a pint. This and similar preparations are usually applied with a sponge, and are effective so long as they retain their strength. A real protection for horses against fly attack is the familiar leather veil or fly-beater attached to the headstall.

Agricultural Chemistry

Fire Risk with Nitrate of Soda.

F. B. COLEMAN.

STOREKEEPERS and farmers are warned against the risk of fire attendant on the storage of nitrate of soda, or empty nitrate of soda bags.

Where reasonable precautions are taken, the fire risk is considerably reduced and may be considered a normal one.

The nature of nitrate of soda is such that when a flame or spark—from any source including a lighted cigarette—comes in contact with bags to which nitrate of soda is adhering, or any organic material in contact with nitrate of soda, there is a real risk of a fierce fire.

Precautions to be taken to reduce the fire risk to a minimum are:—

Store nitrate of soda in an isolated building.

Do not allow smoking near nitrate of soda, or in any shed where it is stored.

All storage should be well removed from any fires, stoves, engines, motor and other vehicles. Matches should not be carried when handling nitrate of soda.

When applying nitrate of soda in the field, bags (either full or empty) should not be stacked near a field of standing cane.

Do not store empty nitrate of soda bags anywhere until they have been thoroughly washed in water changed frequently, then rinsed in clean water and dried at ordinary temperatures. The washing water will be very useful if applied to vegetables or cane or other crops; thus the trouble of washing bags will be repaid.

Shaking the bags after they have been turned is only effective if all the nitrate is removed thereby, and cannot be relied on to remove the fire risk. If the bags have been damp—and this can be caused from moisture in the air—the fibres absorb the nitrate, which can then only be removed by washing as before mentioned.

Nitrate of soda is by itself harmless, but as a provider of large quantities of oxygen, any combustible organic substance impregnated with it, or in contact with it, becomes highly inflammable, automatically renewing its supply of oxygen as it burns. Nitrate fires for that reason are difficult to subdue. They also start very easily and spread with great rapidity, especially when the weather is dry. A spark on a nitrate bag will not go out, but will result in the whole bag being consumed by fire in a very short time.

The best method of dealing with a fire in which nitrate of soda is involved is to—

Isolate if practicable, i.e., confine the fire to as small an area as possible by removing all surrounding inflammable material. Keep this in mind when storing nitrate.

Apply water in volume, but not as a high pressure jet.

Beware of scattering the material.

If nitrate is in a liquid condition, use sand or clean soil to prevent spread.

A chemical fire extinguisher, if one is available, is an effective means of controlling a small nitrate fire.

Finally, observe all precautions regarding storage and do not use unwashed nitrate bags as containers for any other substance.

It is always advisable to notify the insurance company who cover your fire insurance when it is intended to store nitrate of soda.

Even though an insurance protection against fire is obtainable, destroyed buildings and commodities are very difficult and costly to replace, and their destruction represents a serious loss to the nation at the present time.

Nitrate of soda or nitrate of potash is an active element in ordinary gunpowder, but harmless by itself. It is safe to use if those who handle it know its nature; and it is a good fertilizer.

Stock Poisoning by Nitrate of Soda.—As there is a possibility of stock poisoning by nitrate of soda, the material should be stored where animals cannot gain access to it. Stock should be prevented from feeding on lush growth immediately after the application of nitrate of soda.

WEED KILLING—THREE GOLDEN RULES.

Weeds reduce the productive capacity of farms to a much greater extent than many farmers realize. Some farmers and graziers make a practice of carrying a light hoe with them whenever they have occasion to cross a paddock, and it is surprising the number of weeds they remove in the course of a year, almost without conscious effort. Here are three golden rules which it would pay every man on the land to observe:

1. Examine all crop seed for impurities before sowing. If impurities are found, send a sample to the Department of Agriculture and Stock, with a request for advice on them.

2. Keep a look out for any strange plant which makes its appearance on the farm. The Department will give information as to whether any such plants are weeds or otherwise.

3. All strange plants which are either known weeds or likely to become weeds should be destroyed before their seeds ripen and drop to the soil.

Unless these elementary precautions are taken, the time, labour, and money spent on destroying the plants are wasted, as a fresh crop of weeds, larger than before, may appear in the following season.

GADGETS AND WRINKLES

A GOOD GRINDSTONE.

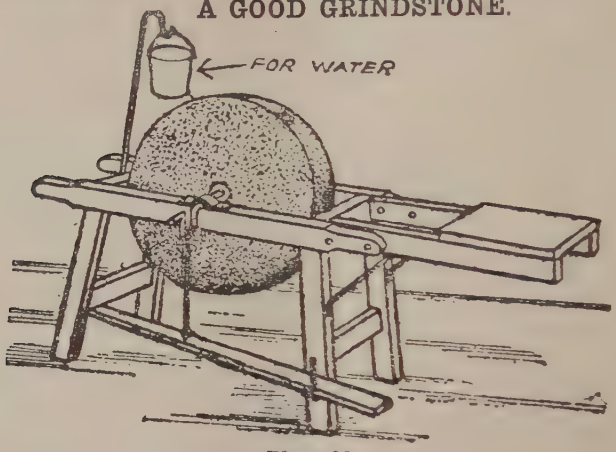


Plate 22.

A good grindstone is a valuable asset. If help is available to turn the handle, the stone can be merely fitted between two posts placed firmly in ground, and having shallow grooves cut out of top of each to serve as bearing surface for spindle. Where sharpening is mostly a one-man job an arrangement such as that illustrated is needed. Some foot treadles oblige the operator to stand on one foot and work treadle with the other. This is very tiring. Bolt two boards to grindstone frame, extend it 2 feet, and place a seat as shown. An uneven stone needs cutting down and toning up. Do this by grinding against end of piece of piping, having stone dry.

If face of grindstone is hard and glazed, pour a little sand on stone every few minutes until glaze is worn off, and stone will cut like new. This condition is caused by exposing stone to weather. It is best to keep stone in shed under cover, but failing this, set it under a tree, and put a box over it when not in use. If bearings are stiff with hard grease, apply few drops kerosene and follow with some oil.

STRAINING WIRE NETTING.

This diagram illustrates a good method of stretching wire netting. Equipment consists of two lengths of 2 by 6 in. wood with two or three bolts passed through them so that they can be securely clamped to end of fencing as shown. A heavy rope is passed around both pieces, around a fence post and tied. A stout stick is used to twist rope, thus pulling fence as tight as desired. Device can be made in a short time from material found on every farm.

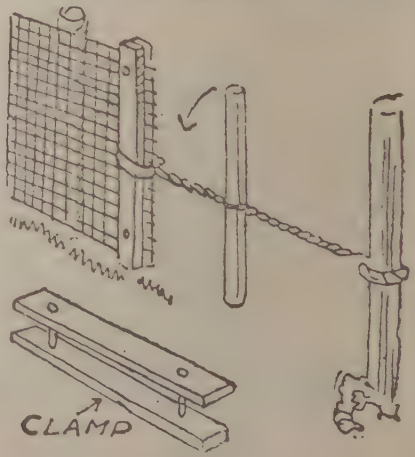


Plate 23.

Knots to Know

SHEET BEND.

This knot (Plate 24) is adapted for joining two ropes of unequal size, but is safe only if the rope is kept tight. It can be made more secure by inserting an additional loop with the smaller rope. When used for small cordage where the ends to be joined are of equal size, the sheet bend makes a reliable and permanent knot.

Plate 24.
SHEET BEND: Fig A.—Sheet bend; Fig. B—Double sheet bend.

FISHERMAN'S KNOT.

This is one of the safest of all knots, and if properly made it cannot possibly slip. It should be noted that there is a wrong way and a right way of tying this not (see Plates 25 and 26). The fisherman's knot can also be used for joining ropes of different sizes by making a hitch of each short end round the rope and pulling it tight. This, however, makes the knot much harder to untie, as the two hitches cannot now be slipped apart by simply pulling on the short ends.

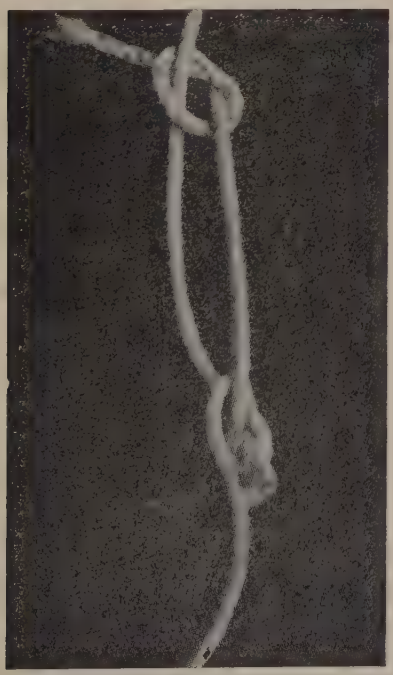


Plate 25.
FISHERMAN'S KNOT.—Wrong method.

Plate 26.
FISHERMAN'S KNOT: Fig. A—In making; Fig. B—Pulled up.

CARRICK BEND.

This is the usual method adopted in connecting two large ropes, and has the advantage that it can be applied at any part of either rope. It is sometimes used when setting up a derrick mast for uniting bights in the middle of two ropes. The central loop is then passed over the mast and the four ends used as guy ropes (Plate 27).

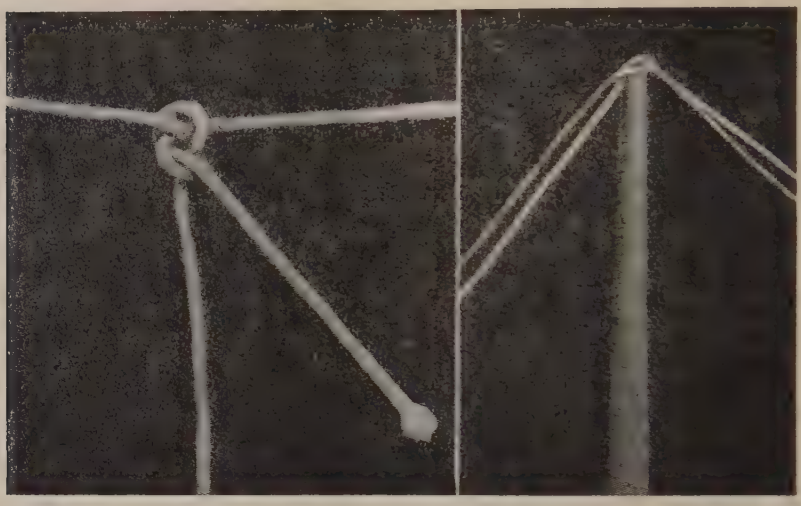


Plate 27.

LEFT—CARRICK BEND. RIGHT—THIS KNOT USED AS A GUY.

BOWLINE.

Where it is desired to make a running noose or a loop which will not slip or pull up tight, the bowline will be found a very useful knot. This knot is very simply made, it is easy to untie, and has a very wide range of application. It is one of the best knots for tying a horse as it cannot possibly tighten up and choke the animal. It is also a good knot for tying the reins to the bit rings, or for making a secure and non-slip hitch.

The knot is commenced by looping the rope as in Fig. A. Note that the loop must be made with the short end on top; and that the short end is led in from below, passed under the long end beyond the loop, and is then led up round this and passed down through the loop.

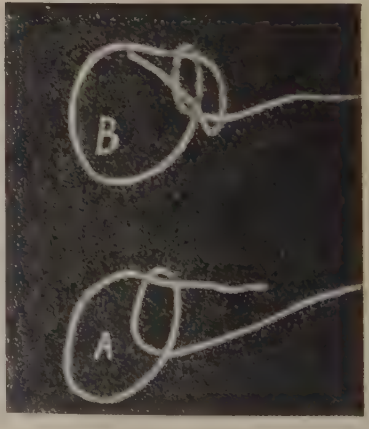


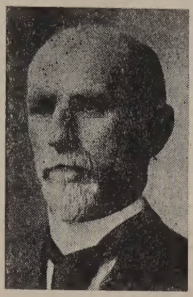
Plate 28.

BOWLINE: Fig. A—Method of tying; Fig. B—Completed knot.

In Memoriam.

HENRY TRYON.

THE death of Henry Tryon, formerly Government Entomologist, at Brisbane on 15th November, 1943, removed a notable figure from the scientific world.



The late Mr. Tryon was born at Buckfastleigh, South Devon, England, on 20th December, 1856. He was the son of Mr. Henry Curling Tryon, and a cousin of the late Vice-Admiral Sir George Tryon, K.C.B., and also of Lord Tryon, formerly Postmaster-General of the United Kingdom. After leaving school, he became a medical student at the London Hospital, one of his instructors being the celebrated Sir Ray Lancaster. Mr. Tryon, however, after a period, realised that he was not destined for the medical profession, and devoted himself to natural science, taking Linnaeus, the great Swedish naturalist, as his master, following in his footsteps, tramping alone all over Sweden, collecting plants, possessing confidence and self-reliance even as a young man. Later, he journeyed to New Zealand, managing a grazing property for his father. Finding this occupation uncongenial, he came to Australia, and devoted himself to entomological research, obtaining in 1883 an appointment at the Queensland Museum.

In 1894 the late Mr. Henry Tryon was appointed Government Entomologist, and in 1901 became also Vegetable Pathologist, holding the dual positions in the Department of Agriculture and Stock until his retirement, under the age limit, in 1929, having been in the Public Service for nearly fifty years.

As a scientist, Mr. Tryon had outstanding ability and distinction, one of his first works in the field of scientific research being a masterly survey of the insect pests and diseases affecting fruit and vegetables in the Toowoomba district. In his official report he described the Queensland fruit fly, this being the first record of this pest. Science was his only interest, but that interest covered a wide field in botany, entomology, geology, conchology, ethnology, astronomy, and Egyptology.

He had organising as well as scientific ability, was keenly interested in Departmental developments, and was on many committees of investigation into scientific problems.

Introduction of Badila Cane.

Among his most notable achievements from a departmental viewpoint was his introduction of Badila variety of sugar-cane. The importance of this was noted by the late Harry T. Easterby in his volume *The Queensland Sugar Industry,* from which the following reference is extracted:—"In August of 1895, Mr. Henry Tryon, Entomologist and Pathologist to the Department of Agriculture, was commissioned to proceed to New Guinea and collect a large number of sugar-cane varieties, which were to be sent to the State Nurseries of Kamerunga and Mackay in Queensland, and also to the Department of Agriculture in New South Wales. Mr. Tryon brought back sixty-six varieties, including the well-known "Badila," which is considered to be the best variety ever introduced into Queensland. The sugar industry undoubtedly owes a great debt of gratitude to the Department of Agriculture for this cane, to which the successful canegrowing in the North is largely attributable. Seeing that in many of these areas 95 per cent. of the cane grown is of this variety, it is not stretching the point to say that quite a number of growers owe their success as cane farmers to it."

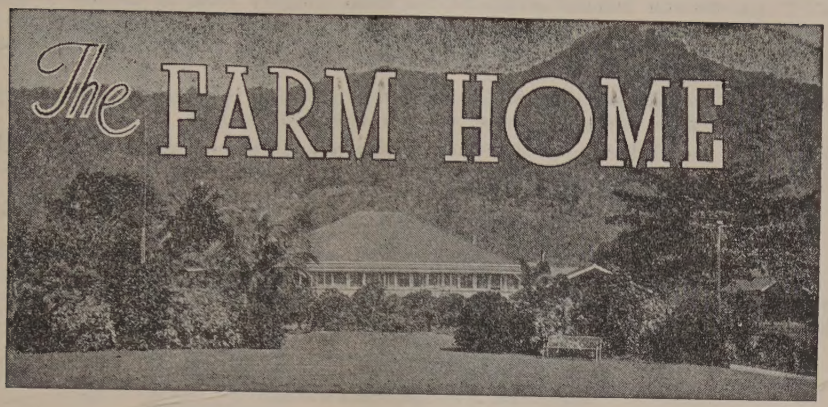
Biological Control of Prickly-pear.

The prickly-pear problem was another important matter which engaged Mr. Tryon's close attention. In his book, *The Biological Control of Prickly-pear*, Mr. Alan P. Dodd makes the following reference to Mr. Tryon's association with this investigation:—"In 1912 the Queensland Government appointed a Travelling Commission, comprising Dr. T. Harvey Johnston, then occupying the Chair of Biology at the University of Queensland, and Mr. Henry Tryon, at that time Government Entomologist to the State, to investigate the avenues of control measures. The Commission spent eighteen months in visiting the many countries where prickly-pears were indigenous or had become acclimatised, and in its subsequent comprehensive and most valuable report made definite recommendations for the introduction under safeguards of certain insects and diseases from America. During its travels the Commission forwarded to Australia from Ceylon small stocks of the cochineals, *Dactylopius ceylonicus* and *D. greenii*; the former insect was successfully reared by Dr. Jean White-Haney at the Dulacca Experiment Station, was liberated in the field, and in the space of a few years almost completely destroyed the scattered areas of *Opuntia monacantha*. At this stage, it should be mentioned that among the prickly-pear insects encountered by the Travelling Commission was *Cactoblastis cactorum*, larvæ of which were found in the Botanic Gardens at La Plata, Argentine. Mr. Tryon actually brought some of the caterpillars alive to Brisbane, but failed to rear them through to the adult stage. Had this effort been successful, the control of prickly-pear may well have been brought about years earlier than has been the case."

Mr. Tryon was also a member of the Commonwealth Commission on cattle tick control. Very few scientists have equalled the late Mr. Tryon in the exceptionally wide scope of his work. His reputation as a scientist was not only appreciated in Queensland and other States, but was world-wide.

A complete list of his published works on economic zoology, entomology, botany, plant pathology, and veterinary science with particular reference to animal parasitology, containing 136 titles, was published in this Journal for August, 1929.

Plate 29.
A HEADER-HARVESTER READY FOR ACTION.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SUMMERTIME "DO'S AND DON'T'S."

DO protect milk and other foods from flies and dust. Keep all foods cool, clean, and covered.

DO protect the children's eyes from sun and glare. It is cruel to take them out without a hat in this climate, and may easily cause eye troubles.

DO give baby his sunbaths in the early morning, especially at the seaside. The fine tender skins of babies are easily burnt.

DO visit or write to the Sister at the nearest Maternal and Child Welfare Centre before taking the children on a journey. The Sister can give a lot of hints on how to make things easier when travelling.

DO provide interests such as outings, some new back-yard toys and games (these are easily made out of odds and ends of timber) for children who are not having holidays away from home this year. The busy interested child is a happy child.

DO keep children out of crowds whenever possible.

DO make things easier during the holidays by doing less cooking. Home-grown salads with cheese or eggs or home-cooked cold meat, and puddings made with fresh fruit are just as nourishing and much more appetising on summer days than hot cooked meals. Try some new salads and vary the dressings for the grown-ups.

DO use vegetable juices, such as carrot juice, if fruit is too expensive or difficult to obtain.

DON'T overclothe the children on hot days. Provided their heads are covered they are happier in one or at the most two simple loosely-cut garments. This saves washing, too.

DON'T allow children to remain in clothes very wet with perspiration, or prickly heat may result. Cool baths and a good talc powder will help to prevent this.

DON'T overfeed the baby and toddler, especially with fat. Give plenty of cool water to drink between meals. In very humid climates, add a pinch of salt to the water.

DON'T allow the children to be over-exposed to the sun, especially on the beach in the middle of the day.

DON'T put a handkerchief over the baby's face; it makes him hot and deprives him of fresh air.

DON'T let children become overtired—the cross naughty child is usually a tired child. Even if they do not sleep, children up to 5 years of age should have a rest of one hour's duration before the midday meal, and at least 12 hours' sleep at night.

DON'T let daylight saving make bedtime late. Children in England have always gone to bed in daylight because of the prolonged twilight.

DON'T give so-called cooling medicines. They are quite unnecessary. The right food, as advised by the Sister at the Welfare Centre, will keep the baby's system in good order.

Any further advice about hot weather and holiday care may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

In present circumstances recommendations are, of course, subject to the availability of ingredients mentioned, or of suitable substitutes.

Cottage Broth.

Remove fat from 1 lb. scrag end of mutton and cut meat into small dice. Cut the following into dice also: 1 carrot, 2 onions, 1 swede turnip, 2 sticks celery, 1 parsnip, and 1 small potato. Melt 1 tablespoon good dripping in a saucepan, add meat and bones, and fry until brown, add 4 oz. well-washed rice and fry a few minutes longer. Add vegetables, salt and pepper, and 1 teaspoon sugar, and fry for a few more minutes. Add 5 pints stock or water and bring to boil slowly. Simmer for 2½ hours; remove bones and skim off fat, add 2 teaspoons finely-chopped parsley, and serve piping hot.

Mutton Broth.

Cut meat off bones from 1 lb. scrag end of mutton, remove fat and cut meat into dice, then cut up bones. Put them into a large saucepan with 3 quarts water and 4 oz. well-washed barley. Bring to boil and simmer for 1 hour, skimming it well during the cooking. Now add 2 carrots, 2 sticks celery, 2 turnips, cut into dice. Simmer for 1 hour longer, then remove bones. Remove fat, add a little finely-chopped parsley, pepper and salt to taste. Serve piping hot. Is is a good idea to cook 3 or 4 mutton shanks in the soup, and these can be served separately with onion, caper or parsely sauce.

Potato and Cheese Soup.

Take 1½ lb. potatoes, 2 oz. grated cheese, 1 small onion, 1 oz. butter, 1 quart vegetable stock, ½ pint milk, 1 carrot, seasoning. Peel the vegetables and cut into small pieces. Fry the onion and carrot for a minute or two in the butter, taking care not to let them colour. Add the potatoes, seasoning, and the stock. Bring to the boil and allow to simmer with a lid on until the vegetables are soft. Whisk up the soup until smooth or put through a wire sieve. Add the milk and, if necessary, some more stock or water. Heat up the soup—do not reboil. Put into a hot tureen or individual cups and sprinkle the grated cheese on top.

Corned Beef Stew.

Melt 2 level tablespoons butter in a saucepan, add 2 finely-chopped large onions and fry until light-brown. Add 2 cups diced beef, 6 peeled and halved tomatoes, 2 cups cooked haricot beans. Bring very slowly to boiling point, season with pepper and salt, and simmer very gently for 10 minutes. Make a border of mashed potato and fill centre with stew. Sprinkle with chopped parsley.

Cornmeal Pikelets.

Sift ½ cup self-raising flour, ½ cup cornmeal, pinch salt, and 2 tablespoons sugar into a basin; beat 1 egg well, add a little more than ½ cup milk. Pour into centre of flour and mix well together. Dissolve ¼ level teaspoon bicarbonate soda in about 1 tablespoon boiling water, add to batter with one dessertspoon melted butter. Beat well and bake in spoonfuls on a hot, greased girdle. Serve with honey or maple syrup.

A. H. TUCKER, Government Printer, Brisbane.